

Controller operating unit

B 70.4045
Operating Instructions

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1.1 Preface



Please read these Operating Instructions carefully before starting up the instrument.

Keep the manual in a place which is at all times accessible to all users.

Please assist us to improve this manual wherever necessary.

Your suggestions will be most welcome.

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With the controller operating unit it is possible to

1. set the parameters for all modules in the system,
2. display and alter process variables during operation,
3. output an alarm in the event of a system failure or error,
4. switch the user language over to English, German or French.



If the instrument does not respond as described in the Operating Instructions, you are asked not to carry out any manipulations on the unit which are not permitted. You could endanger your rights under the instrument warranty. Please contact the nearest office or the main factory.

Trademarks

LON and Neuron are registered trademarks of the Echelon Corporation.

1.2 Delivery package

Please check each delivery for completeness and damage.

If anything is missing or damaged, please contact the nearest office or the main factory.

The equipment supplied consists of:

- the JUMO mTRON controller operating unit,
- Operating Instructions,
- 1 plug-in connector with screw terminals
- 2 mounting brackets.

1 Introduction

1.3 Typographical conventions

Warning signs

The signs for **Danger** and **Warning** are used in this Manual under the following conditions:



Danger

This symbol is used when there may be **danger to personnel** if the instructions are disregarded or not followed accurately!



Warning

This symbol is used if there may be **danger to equipment or data** if the instructions are disregarded or not followed accurately!

Note signs



Note

This symbol is used when your **special attention** is drawn to a remark.



Reference

This symbol refers to **further information** in other handbooks, chapters or sections.

abc¹

Footnote

Footnotes are notes which refer to certain points in the text. Footnotes consist of two parts:

Marking in text and footnote text.

The markings in the text are arranged as continuous raised numbers.

The footnote text (in smaller typeface) is placed at the bottom of the page and starts with a number and a full stop.



Action

This symbol indicates that an action is described. The individual steps are marked by this asterisk, e.g.:

- * switch off the supply
- * pull connectors off the module

1.4 Type designation

The type code of the controller operating unit only specifies the supply voltage (1), which must correspond to the voltage shown on the label. The label is affixed to the housing.

(1)
704045 /0-

..

(1) Supply..... ..

Type	Code
93 — 263V AC 48 — 63Hz	01
20 — 53V DC/AC 0/48 — 63Hz	22

2 Electrical connection

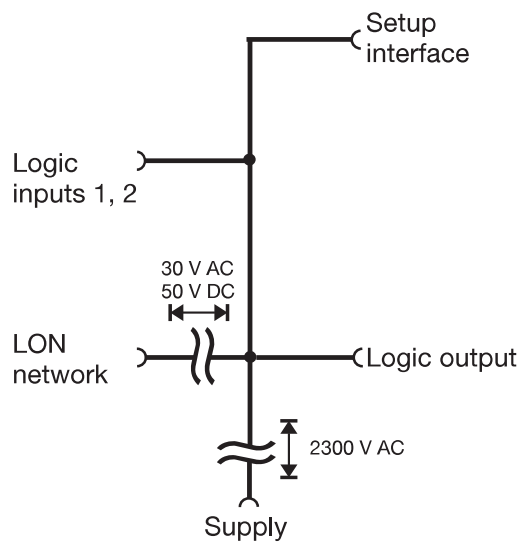
2.1 Notes on installation

- ❑ The choice of cable, the installation and the electrical connection of the controller operating unit must conform to the requirements of VDE 0100 “Regulations on the installation of Power Circuits with nominal voltages below 1000 V”, or the appropriate local regulations.
- ❑ Work on the controller operating unit must only be carried out to the extent described and, like the electrical connection, only by properly qualified personnel.
- ❑ If contact with live parts is possible when working on the controller operating unit, it has to be isolated on both poles from the supply.
- ❑ The external fuse of the supply should not be rated above 10A (slow).
- ❑ Electromagnetic compatibility conforms to the standards and regulations listed under Technical Data.
⇒ Data Sheet 70.4045 “Technical Data”
- ❑ The controller operating unit is not suitable for installation in hazardous areas.
- ❑ Run input, output and supply lines separately, and not parallel to each other.
- ❑ If no technical earth is available in the system, connect terminal TE on the module to the protective earth (PE).
- ❑ Earth the LON interface at both ends on terminal TE.
- ❑ Do not loop earth connections, i.e. do not run them from one module to another; run them singly, e.g. to earth terminals on the rail (short leads!).
- ❑ Apart from faulty installation, incorrect settings on the module may interfere with the proper operation of the subsequent process. Provision should therefore always be made for safety devices independent of the module, such as overpressure valves or temperature limiters/monitors. Setting up must be restricted to properly qualified personnel. Please refer to the appropriate safety regulations in this connection.

2 Electrical connection

- ❑ Setup interface and inputs are **not** isolated.
If any inputs are carrying a voltage, they have to be disconnected before the setup operation with a grounded PC, or carry out setup with an unearthed PC or laptop.
- ❑ Pull off plug connectors with screw terminals only when the circuits are de-energised.

2.2 Isolation



2 Electrical connection

2.3 Suitable cables

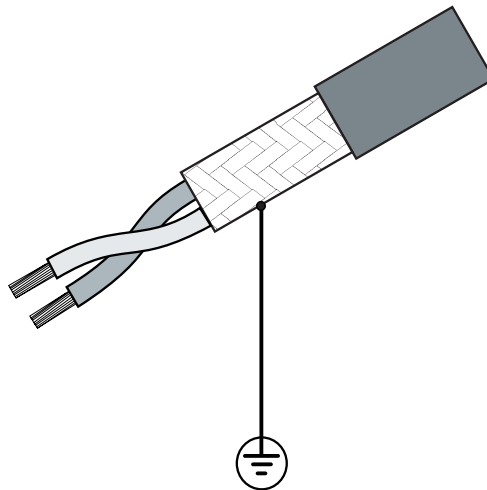
LON interface

Screening

A screened twisted pair is recommended for the connecting cable, which must have the following cable values:

- Characteristic impedance 100 — 120 Ω ,
- Screen capacity 60 pF/m approx.

If a screen is available, it should be connected to the technical earth (TE) of the LON interface.

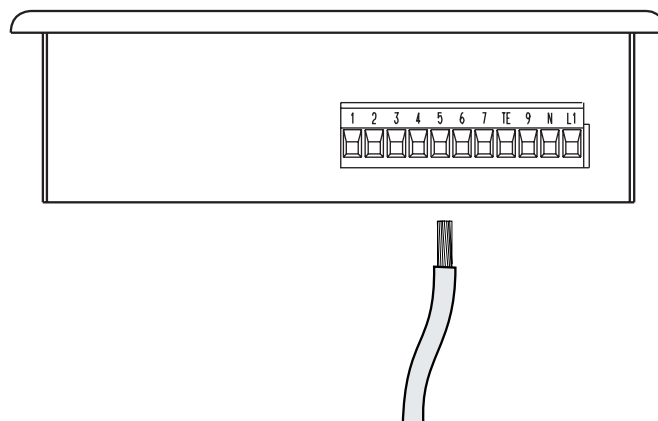


Cable types

Structure	Cable cross-section	Max. cable length
Line	1.4 mm ² (16 AWG) 0.34 mm ² (22 AWG)	2700m 1400m
Ring/star/mixed	1.3 mm ² (16 AWG) 0.34 mm ² (22 AWG)	500m 400m

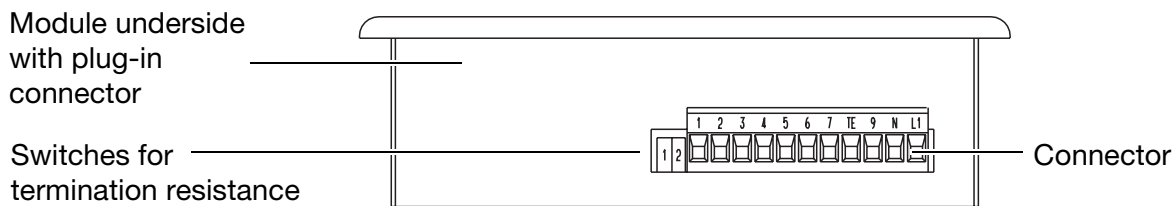
Other connections

Conventional stranded copper cable of 1.5 mm² cross-section is suitable for connecting transducers, supply and logic inputs to screw terminals.



2 Electrical connection

2.4 Connection diagram



The electrical connection must only be carried out by properly qualified personnel!



The supply must correspond to the voltage specified on the label.

Connection for	Terminals		Notes	Diagram
Logic inputs	Input 1	Input 2		
Floating contacts	1 3	2 3		
Logic output 5V 40mA	4 + 3 -			
LON interface	7 = TE		screen	
	6 = Net_A 5 = Net_B		any polarity	
	9 = not used			
Supply as label	AC	UC=DC/AC		
	L1 line N neutral TE technical earth	L1 } any polarity N } polarity TE technical earth		

2 Electrical connection

2.5 Network connection

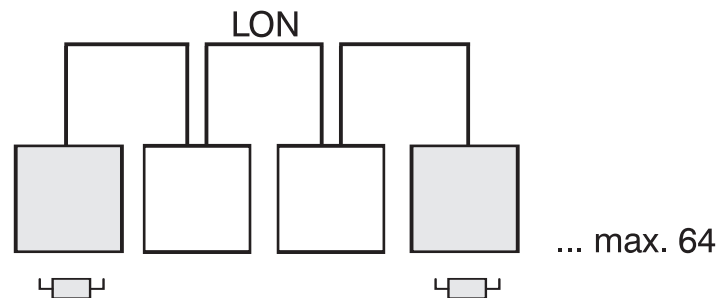
LON

The JUMO mTRON automation system incorporates the fieldbus network concept called LON (Local Operating Network).

A screened twisted pair is used as a transmission line.

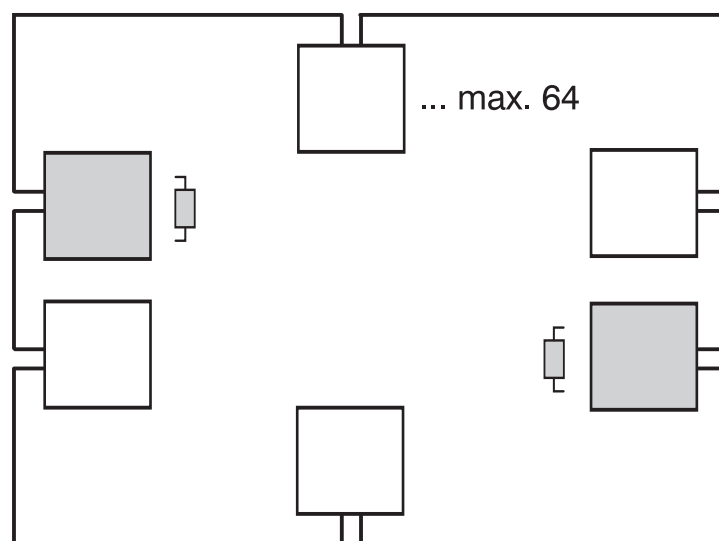
The connection can be made as line, ring, star or mixed structure (free topology):

Line structure



The mechanical ends are provided at both ends with a termination resistance which is activated by a switch on the module.

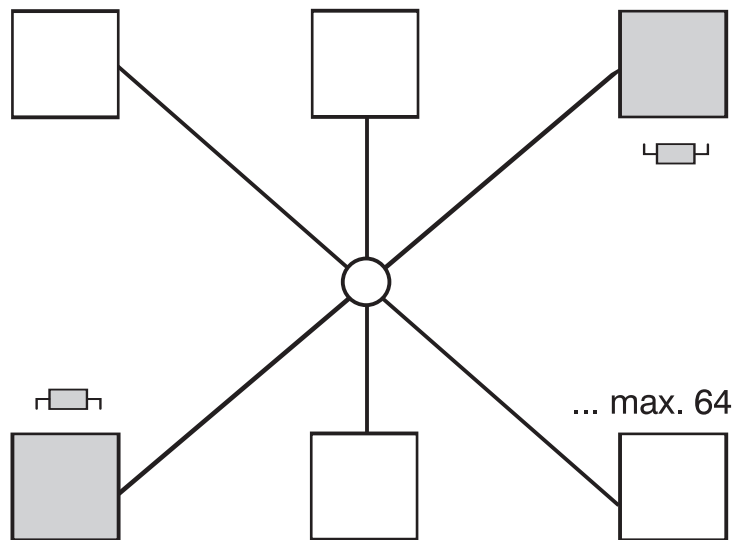
Ring structure



With this wiring layout the network remains functional even after a break. The termination resistances of any two modules must be activated by the switch on the front.

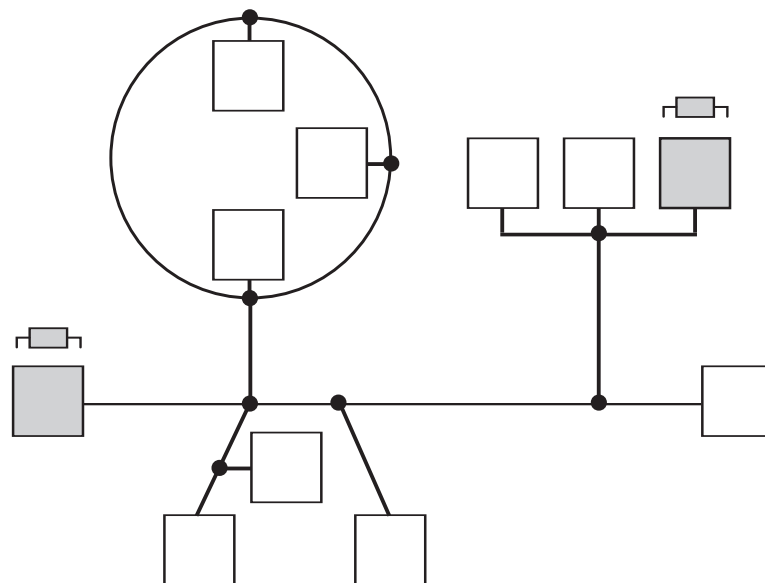
2 Electrical connection

Star structure



In this wiring layout the termination resistances of any two modules have to be activated.

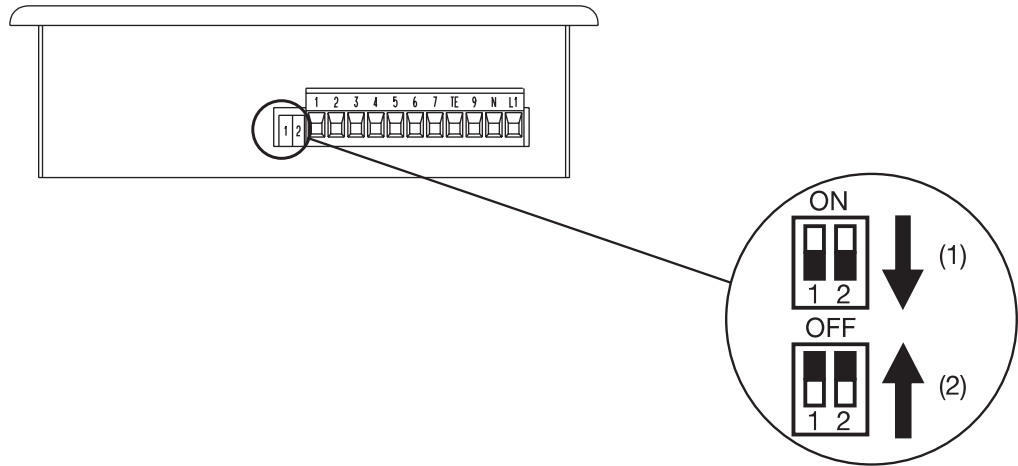
Mixed structure



In this layout, too, the termination resistances of any two modules have to be activated.

2 Electrical connection

2.6 LON termination resistance



The switches for the termination resistance of the LON network are located on the underside of the controller operating unit, to the left of the plug-in screw connectors.

* Set the switches as required

Switches down: termination resistance active (1)

Switches up: termination resistance inactive (2)

Further mTRON modules

⇒ Installation Instructions 70.4010 (controller module) and 70.4040 (communication module)

3 Mounting in position

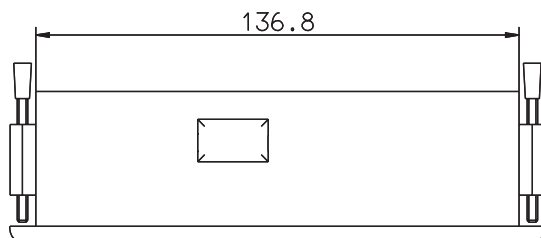
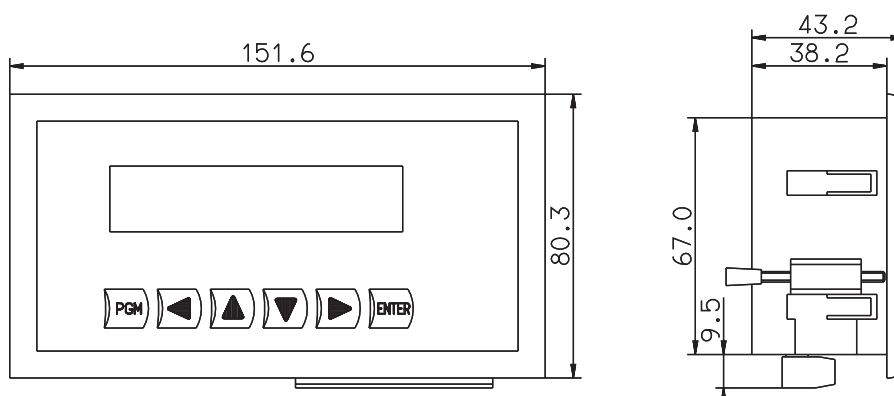
3.1 Location and climatic conditions

The operating unit is suitable for fitting into control panels/doors. Protection is IP65 on the front and IP20 at the back (EN 60 529).

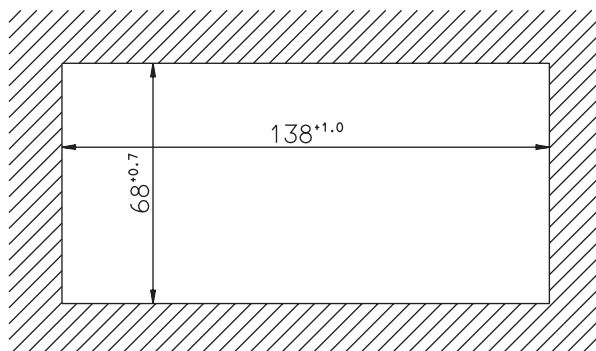
The ambient temperature at the location can be between 0 and 50°C at a relative humidity not exceeding 80 % without condensation.

⇒ Data Sheet 70.4035 “Technical data”

3.2 Dimensions



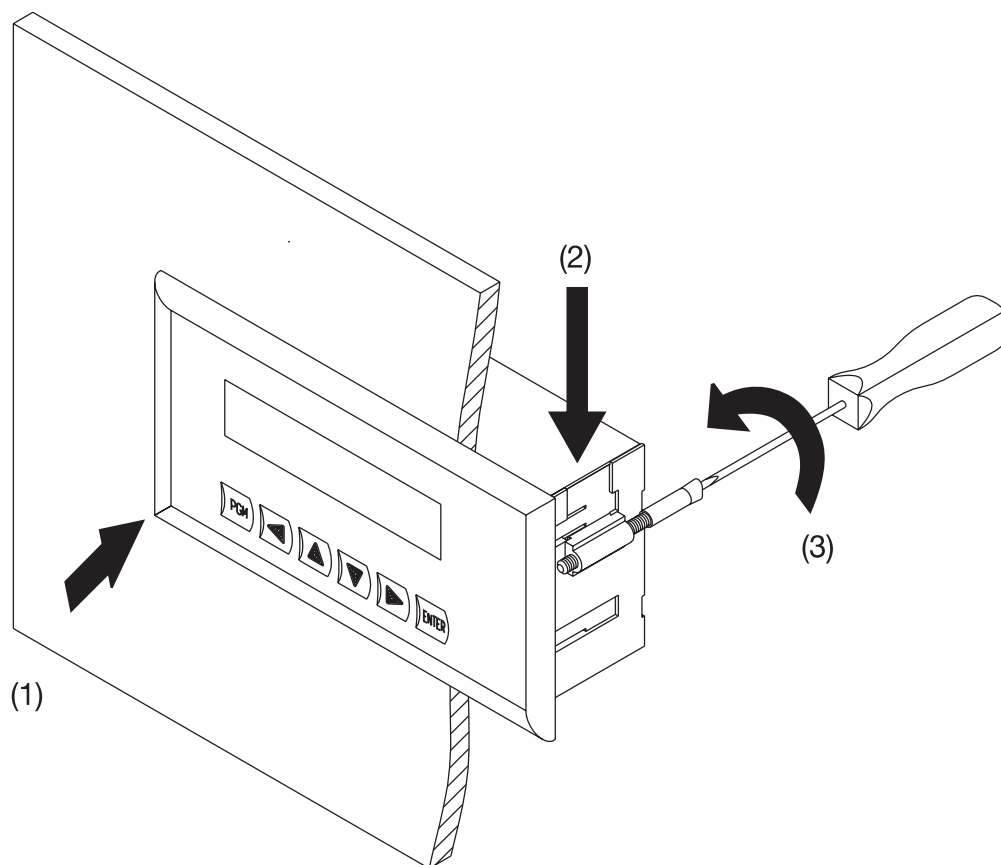
panel cut-out to DIN 43 700



3 Mounting in position

3.3 Fitting the operating unit in position

- * Insert the operating unit into the panel cut-out from the front (1)
- * Insert the mounting brackets into the recesses at the sides (2)
- * Tighten up the mounting brackets evenly against the back of the panel (3)

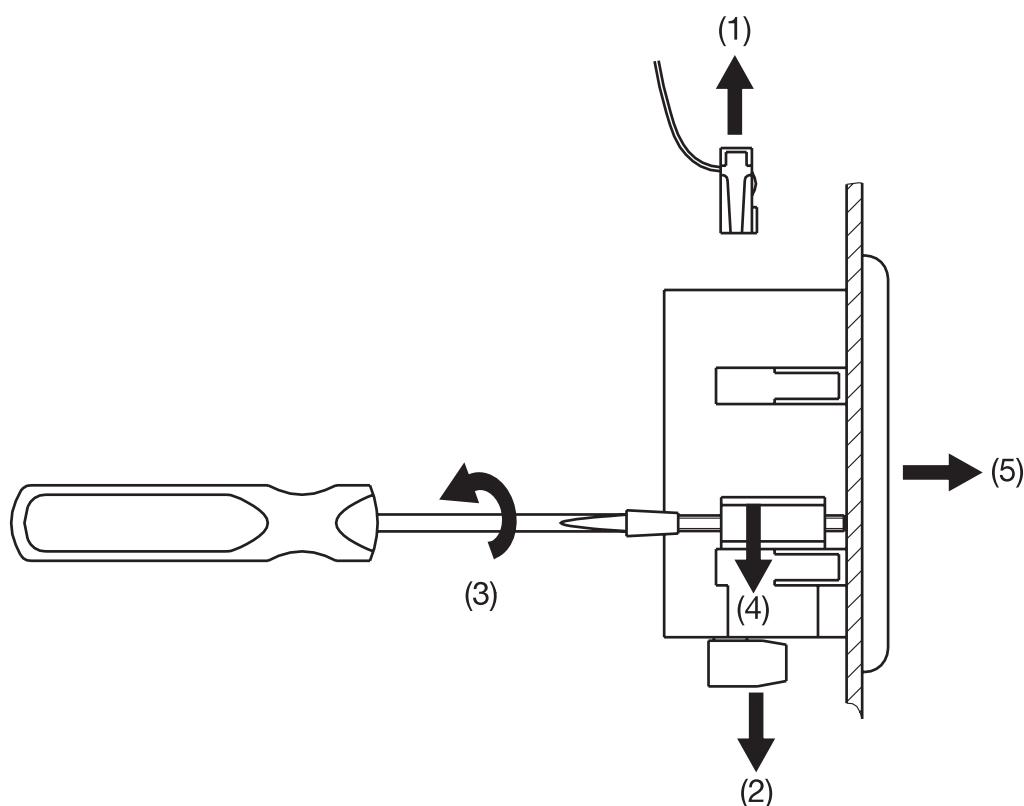


3.4 Removing the operating unit



Switch off the power supply!

- * Pull off the setup plug (1)
- * Pull off the connector (2)
- * Release the mounting brackets using a screwdriver (3) and take them out of the recesses at the sides (4)
- * Pull the operating unit forward out of the panel (5)

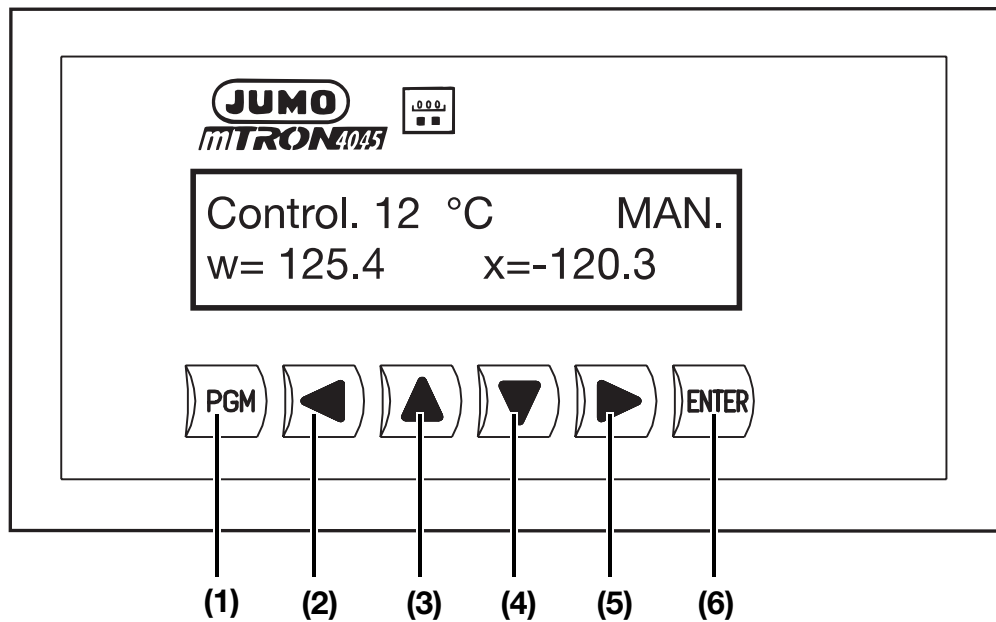


Special conditions apply after a power failure or a change of the operating unit.

⇒ System Manual Part 8, Section 6.1 “Overview of levels”

4 Displays and controls

Keys



Keys

six keys on the front to operate the module

Setting the key inhibit

⇒ Section 7.2.7 “Inhibits”



PGM (1)

key to change between process level and program levels



Backwards (2)

moves one step back without storing



Selection key (3)

selects forwards between different items in the ring list / incrementing



Selection key (4)

selects backwards between different items in the ring list / decrementing



Forwards (5)

moves one step forwards without storing

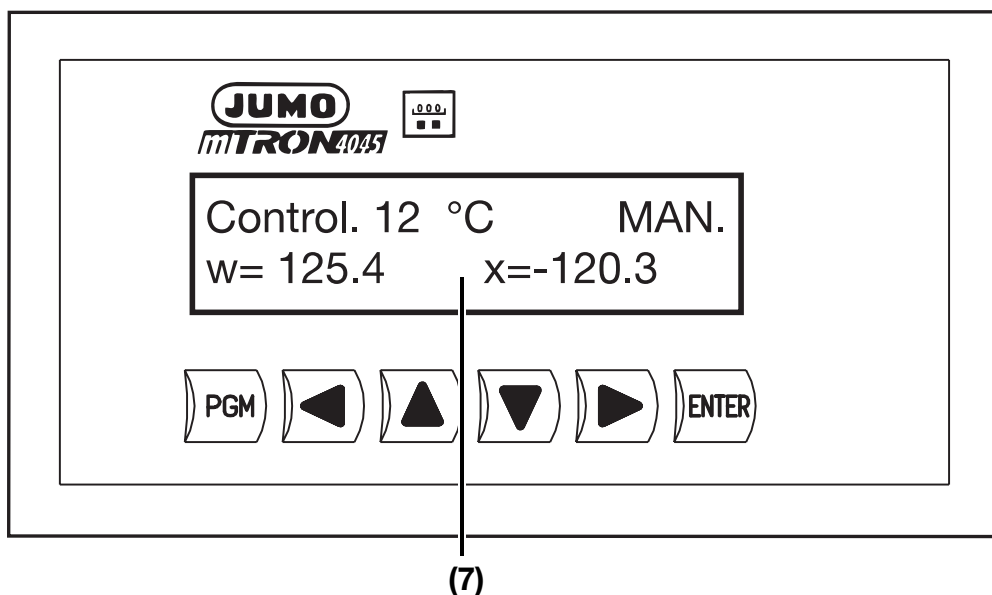


ENTER (6)

stores edited values and acknowledges alarms

4 Displays and controls

Display



LC display (7)

2x 20 characters for displaying texts and data

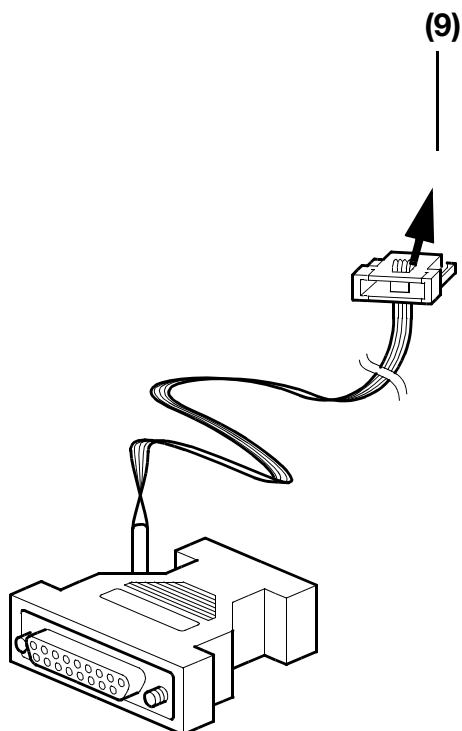
Character height: 5.5mm

Adjusting contrast, language, switch-off time and display darkening

⇒ Section 7.2.4 "Display"

Interface

Is only required in connection with the JUMO mTRON - iTOOL project design software.

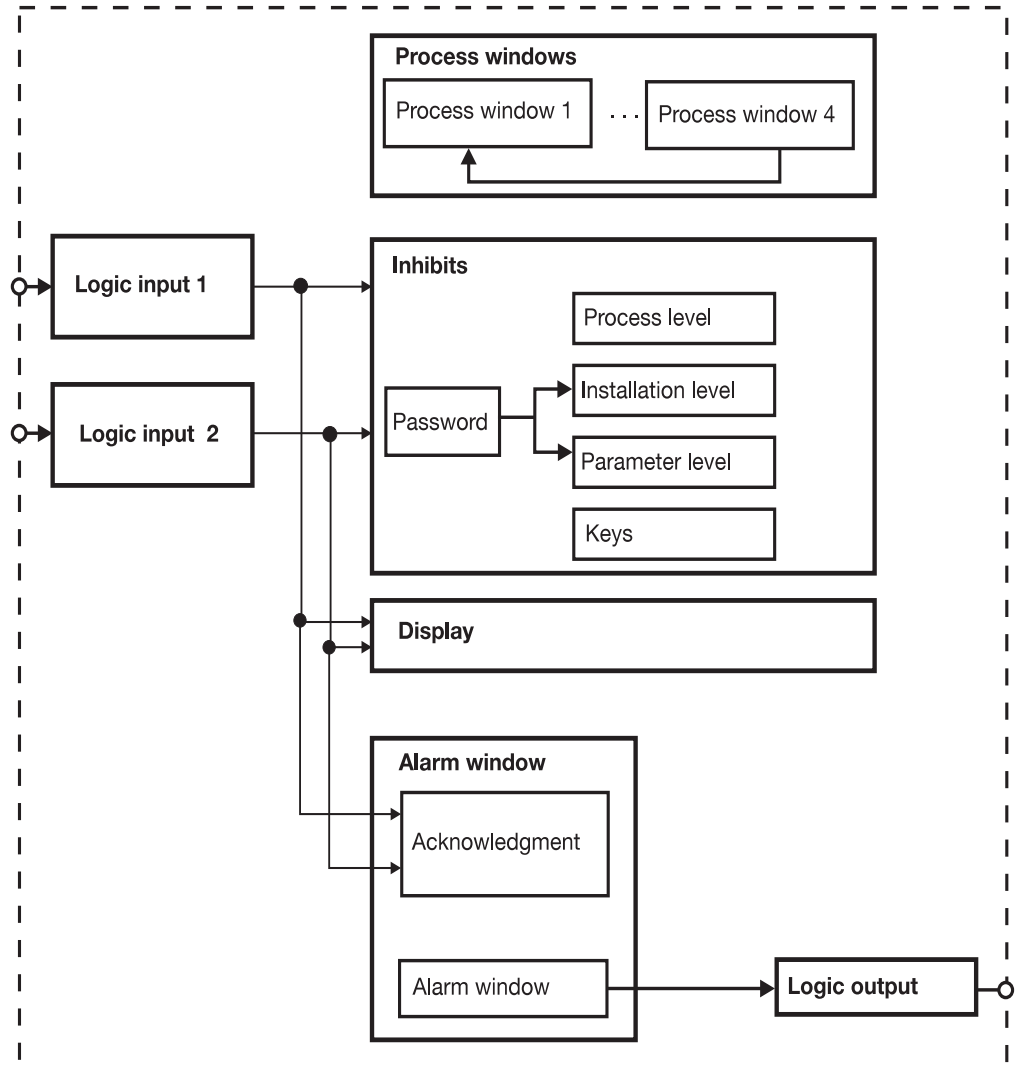


5 Overview of functions

5.1 Controller operating unit

Block structure

The block diagram shows the module function (framed), with the hardware inputs indicated on the left, and the hardware output on the right..



Setting the parameters for the functions

⇒ Chapter 7 “Parameter level”

5 Overview of functions

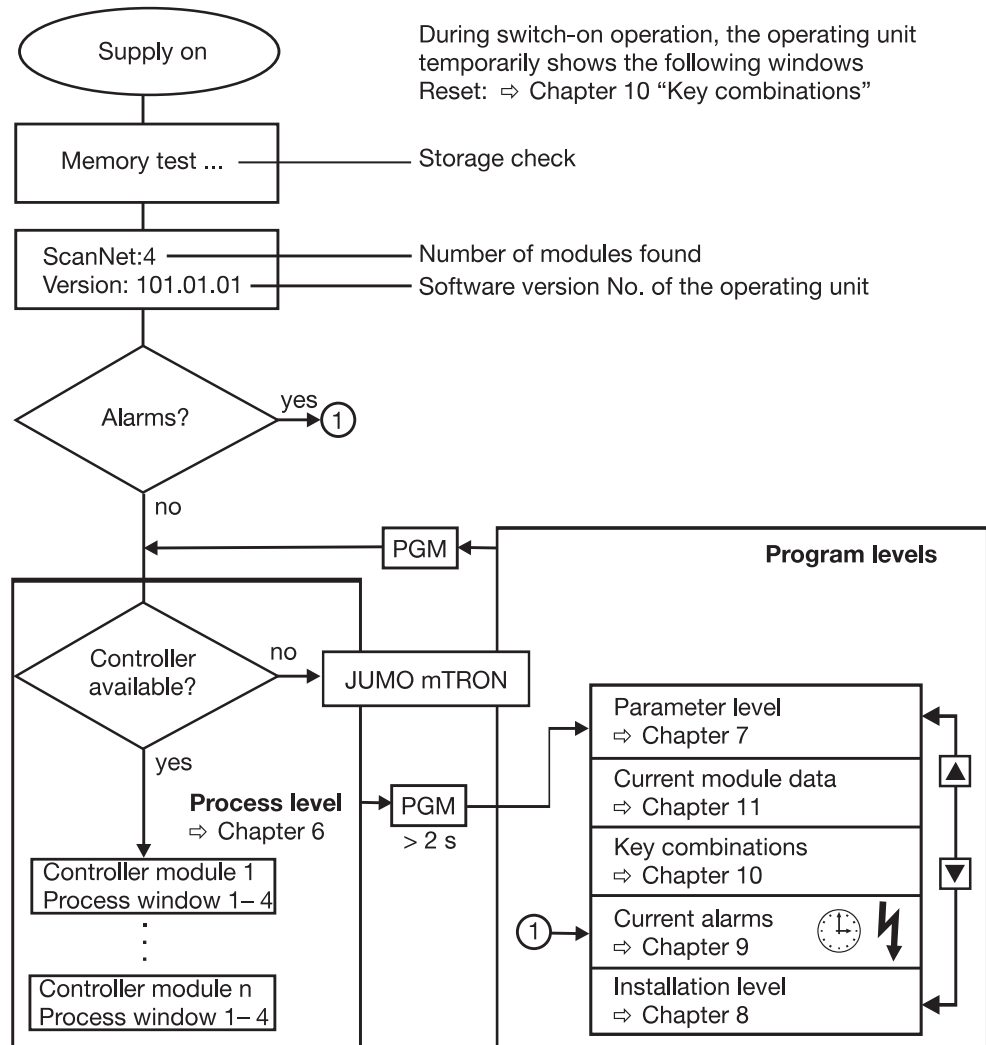
5.2 Operating levels of the controller operating unit

The controller operating unit can be on different levels. After the supply has been switched on, the controller operating unit first assesses its network surrounding, i.e. which modules are connected and their names (reset window).



A module with the setup connector inserted will not be found during the reset procedure.

Then the controller operating unit switches automatically to the process level, where it displays process windows. Errors and alarms are indicated as soon as they occur.



Automatic alarm repetition:
After the last key stroke on the operating unit and when the repeat time has elapsed, there is an automatic change to the "Current alarms" level
⇒ Chapter 9



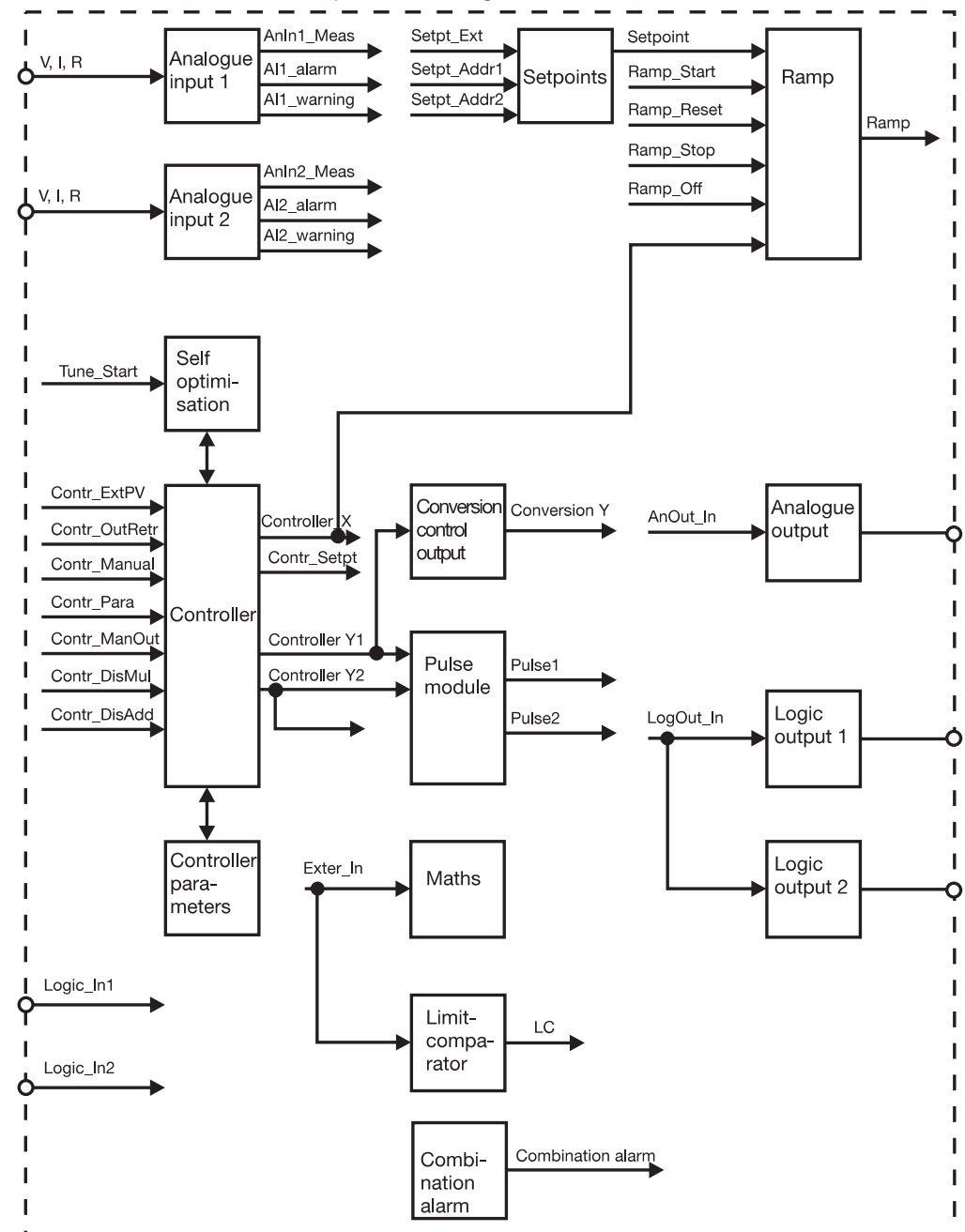
Fresh alarms:
With fresh alarms, instantly on to "Current alarms"
⇒ Chapter 9

5 Overview of functions

5.3 Controller module

Block structure

The block diagram shows the module function (framed), with the hardware inputs on the left and the hardware outputs on the right.



Network-variable inputs/outputs are shown as arrows on the function blocks. They can only be used when operating JUMO mTRON - iTOOL:

⇒ System Manual 70.4000 "JUMO mTRON - iTOOL"

Setting the parameters for the functions

⇒ Chapter 7 "Parameter level"

“Process level” means the cyclic sequence of process windows and, if appropriate, also their operation.

6.1 Sequence of the process windows

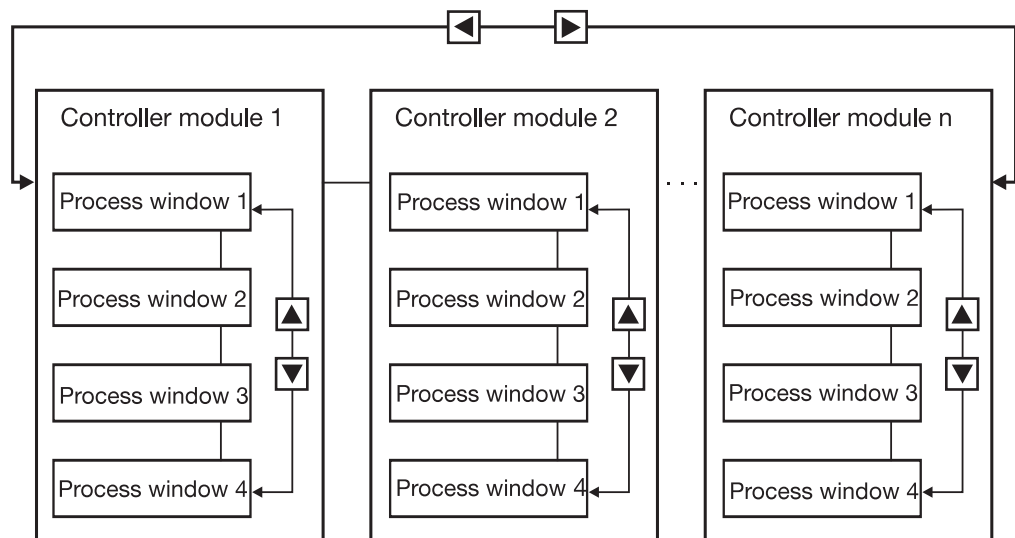
The controller operating unit displays 4 different process windows for each controller module. All connected controller modules are run through on the same level either cyclically or by manual operation (adjustable via scroll time).

Set scroll time ⇒ Section 7.2.2 “Process windows”

The diamond (◆) indicates whether the scroll operation is activated:

(◆) blinks cyclically: Controller modules 1 — n are run through cyclically in ascending order

(◆) is stationary: Controller modules 1 — n can be switched over manually by keys



Manual changeover

- * Use the key to hold a process window (the diamond stops blinking)
- * With the and keys, select the process windows of a controller
- * Using the and keys, select the controllers on one process window level

Scroll operation

- * Continue the cyclic sequence of the process windows with (diamond blinks)

6 Process level

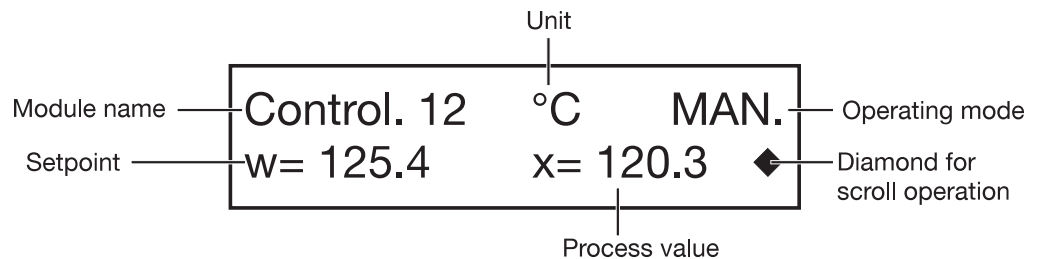
6.2 Contents of the process windows

4 types of process windows are available.

Process window 1

The process window shows the controller values of the controller module:

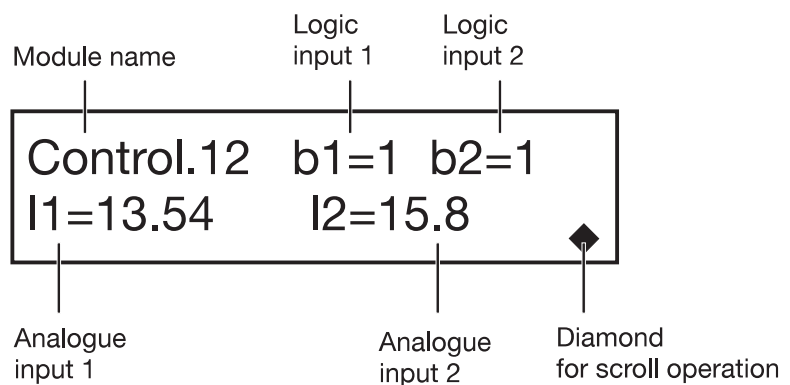
Module name: Name of the controller module
Unit: Physical unit of the setpoint and process value
Operating mode: MAN., AUTO, TUNE
Setpoint: Setpoint of the controller function
Process value: Process value of the controller function



Process window 2

This process window shows the input variables of the controller module:

Module name: Name of the controller module
b1, b2: Logic inputs 1 and 2
I1, I2: Analogue inputs 1 and 2



Process window 3

This process window shows the output variables of the controller module.

Modulating controller

Controller output Y: Indicates which switching output is currently active

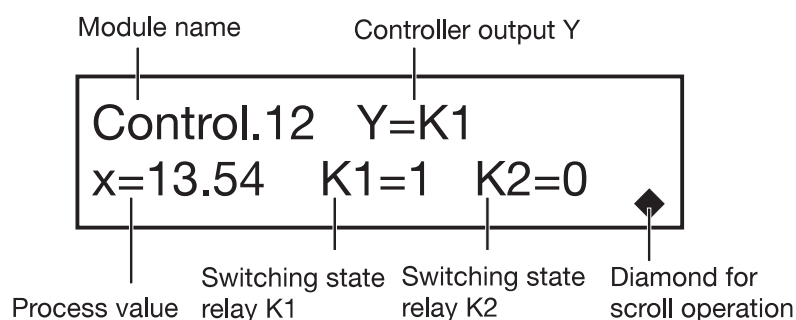
Module name: Name of the controller module

Controller output Y: K1, Zero, K2

Process value: Process value of the controller function

Switching state relay K1: 0.1

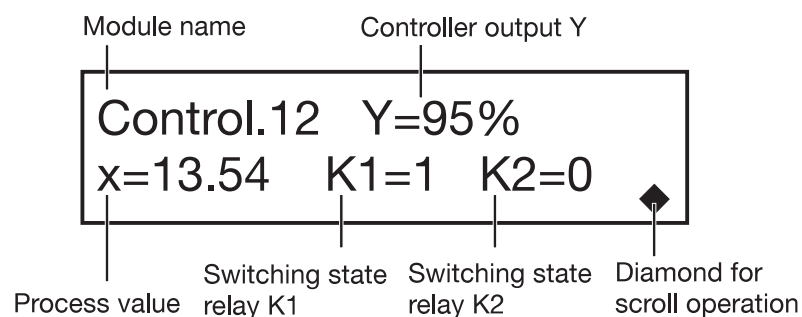
Switching state relay K2: 0.1



In the case of double-setpoint and modulating controllers, the selector of the logic output 2 must be set to “Pulse 2” [1] instead of “Limit comparator” [2].

⇒ Section 7.1.14 “Logic output”

All other controllers



On double-setpoint controller set Y_{\min} from 0 to -100

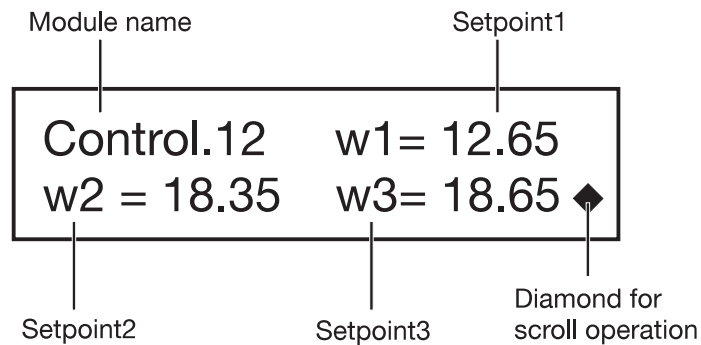
⇒ Section 7.1.8 “Controller parameters”

If the controller is in manual operation, output Y can be edited.

6 Process level

Process window 4

This process window shows the first 3 setpoints of the controller setpoint table.



The fourth setpoint w4 can only be viewed and edited at the parameter level.

⇒ Section 7.1.3 “Setpoints”

6.3 Editing the process windows

Alteration to process values can be inhibited.

⇒ Section 7.2.7 “Inhibits”


The module name can be edited through the parameter level.

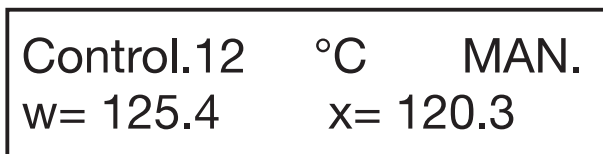
⇒ Section 7.1.1 “Module”




Process window 1

- * Hold the scroll operation with  (the diamond is stationary)


Editing

- * Press  briefly (no longer than 2sec)
The operating mode blinks and the diamond is no longer visible.



- * Use keys  and  to switch the operating mode from MAN. over to AUTO and switch off TUNE.
- * Save with 

Quit editing

- * Press  briefly (no longer than 2sec)

The operating mode can only be edited when the parameter SelManOp is set to [3].

⇒ Section 7.1.5 “Controller”

Altering the unit:

⇒ Section 7.1.3 “Setpoints”

Activating the operating mode TUNE:

⇒ Section 7.1.1 “Self-optimisation”

Process window 3

As already described under “Process window 1”, the output Y can be edited if the controller module is in MANUAL mode.

Control.12 Y=95% MAN.
x=13.54 K1=1 K2=0






The output can only be edited if the parameter SelManOut is set to [2].

⇒ Section 7.1.5 “Controller”

Process window 4

The three setpoints can be edited as described in Section 6.3.1.

Control.12 w1= 126.5
w2= 86.5 w3=-119.2

- * Use keys  and  to edit the variable which is currently blinking
- * Use key  to select w1 – w3 forwards and key  for the reverse sequence (without saving)
- * Save with  and continue to the next value to be edited.

The setpoints can be selected via the 2 logic inputs.

Address 1 = [2]

Address 2 = [3]

⇒ Section 7.1.3 “Setpoints”

The fourth setpoint w4 can only be edited at the parameter level.

⇒ Section 7.1.3 “Setpoints”

6 Process level

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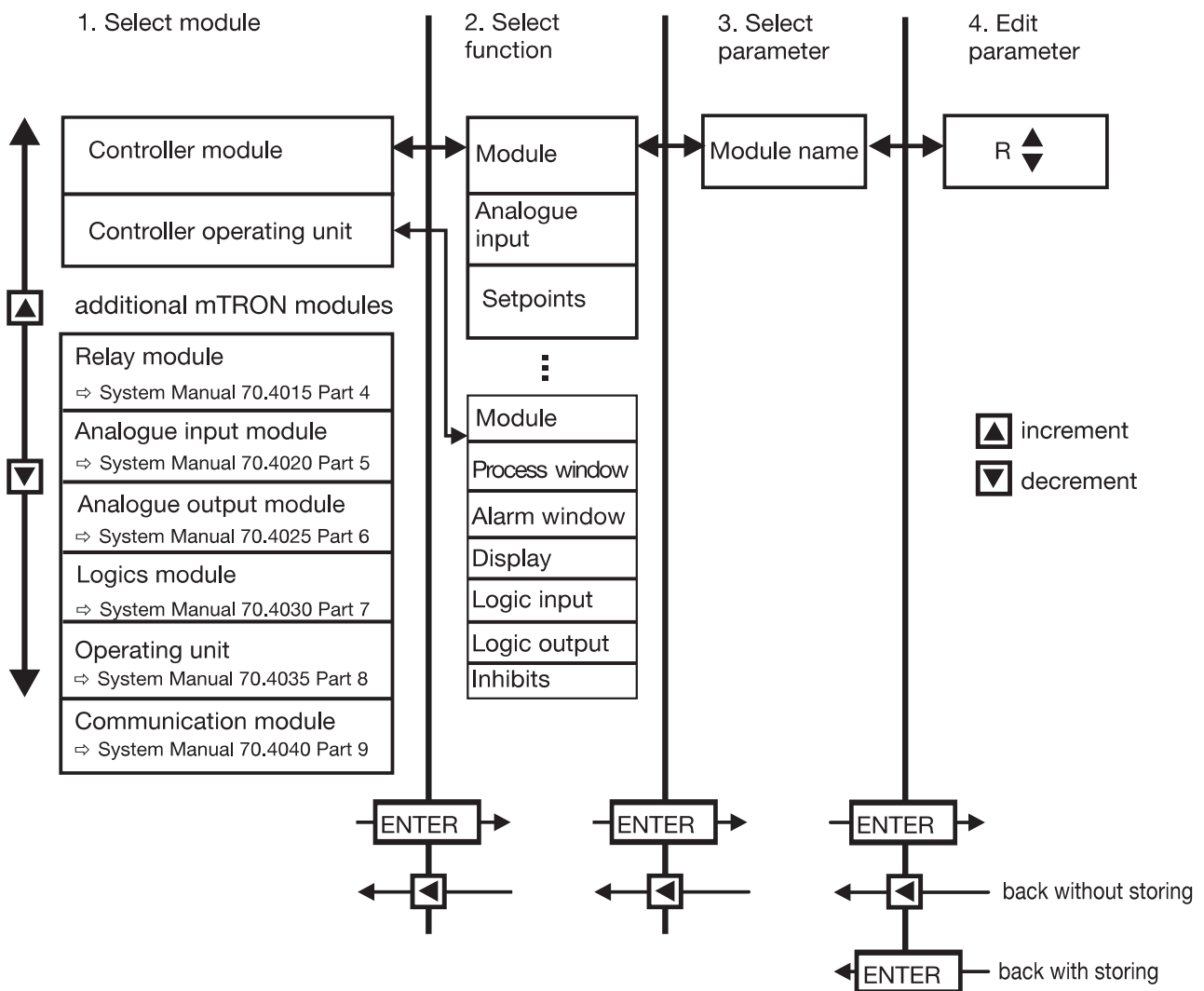
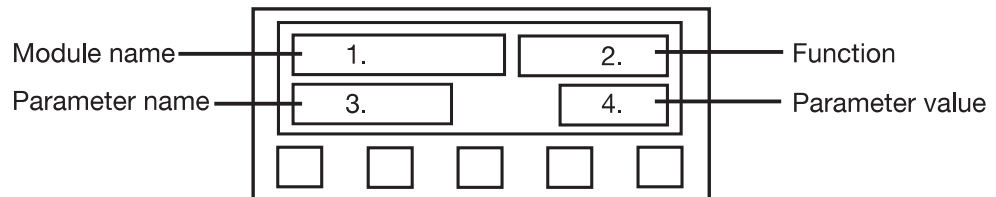
7 Parameter level

At the parameter level, the parameters of all modules can be indicated and edited using a uniform method.

Parameter selection

The parameters of all modules are arranged in a 4-step hierarchy:

- * Select mTRON module (1)
- * Select function (2)
- * Select parameter (3)
- * Edit parameter (4)



7 Parameter level

7.1 Controller module

7.1.1 Module

A characteristic module name for the task of the module in the process facilitates work on the system.

Parameter	Selection/settings	Explanation
Module name [Modname]	(Text) Controller	Name of the module (16 characters) Only the first 8 characters are visible in the process windows of the controller operating unit.

■ = factory setting [] = short name in the controller operating unit

7.1.2 Analogue input

2 measurement inputs measure thermocouple voltage, resistance or standard signals which are listed in the table.

[AnalogInp1],
[AnalogInp2]

Parameter	Selection/settings	Explanation
Sensor [Sensor]	No sensor connected [NoSens] (channel 1) Thermocouple CJ temperature internal [CJInt] Thermocouple CJ temperature constant [CJ const] Potentiometer [Potent] 0—400 Ohm [0/400Oh] (channel 2) 0—50mV [0/50mV] 0—10V [0/10V] 2—10V [2/10V] 0—20mA [0/20mA] 4—20mA [4/20mA] 0—1V [0/1V] 0.2—1V [0.2/1V] 10—50mV [10/50mV] -1 to +1V [-/+1V] -10 to +10V [-/+10V] 0—50mA AC [50mA AC] -50 to +50mV [-/+50mV]	Defines the transducer to be connected to the specific analogue input “0 — 400Ω” must be set for the Pt100 transducer! Heater current 0 — 50mA AC with analogue input 2 only!
Scaling start [ScalStart]	-1999 to +9999 unit 0 unit	With standard signals, potentiometer and heater current: Defines the display value (measurement) of the start value of the signal input range. With Pt100 and thermocouples: makes an offset correction.
Scaling end [ScalEnd]	-1999 to +9999 unit 100 unit	The value defines the display value (measurement) for the end value of the standard signal or potentiometer range.
Unit [Unit]	(various) °C [°C]	Defines the physical unit of the measurement value

■ =factory setting [] = short name in the controller operating unit

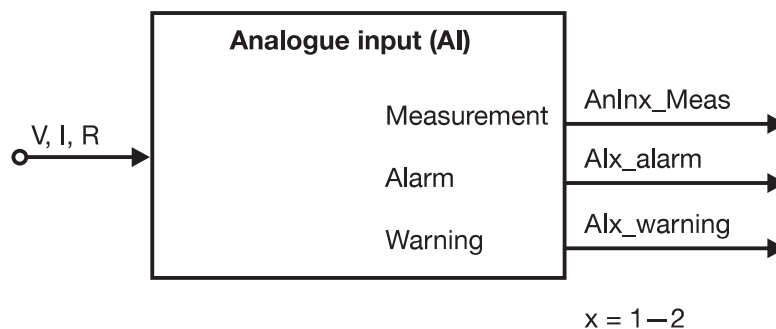
7 Parameter level

Parameter	Selection/settings	Explanation
Constant cold junction temperature [CJTemp]	-5 to +100°C 50°C	Indicates the cold junction temperature of the thermocouple. It is only valid when "Thermocouple constant cold junction temperature" is selected under the parameter "Sensor".
Linearisation [Linearisn]	Linear [Linear] (channel 2) Pt100 [Pt100] (channel 1) Type L: Fe-Con [TypeL] Type K: NiCr-Ni [TypeK] Type S: Pt10Rh-Pt [TypeS] Type R: Pt13Rh-Pt [TypeR] Type B: Pt30Rh-Pt6Rh [TypeB] Type U: Cu-Con [TypeU] Type T: Cu-Con [TypeT] Type J: Fe-Con [TypeJ] Type N: Ni-CrSi [TypeN]	Determines the linearisation function for the sensor
Min. limit [MinLimit]	-1999 to +9999 unit 0 unit	If the measurement falls below the preset value, an alarm is produced.
Max. limit [MaxLimit]	-1999 to +9999 unit 100 unit	If the measurement goes above the preset value, an alarm is produced.
Warning differential [WarnDiff]	-1999 to +9999 unit 0 unit	The value of the process value produces a warning alarm if: process value > max. limit - warning differential and also if: process value < min. limit + warning differential.
Filter time constant [FiltTime]	0.0 — 40.0sec 1.0sec	The time constant which is used to filter the measurement value with two digital PT1 filters.

■ =factory setting [] = short name in the controller operating unit

Function

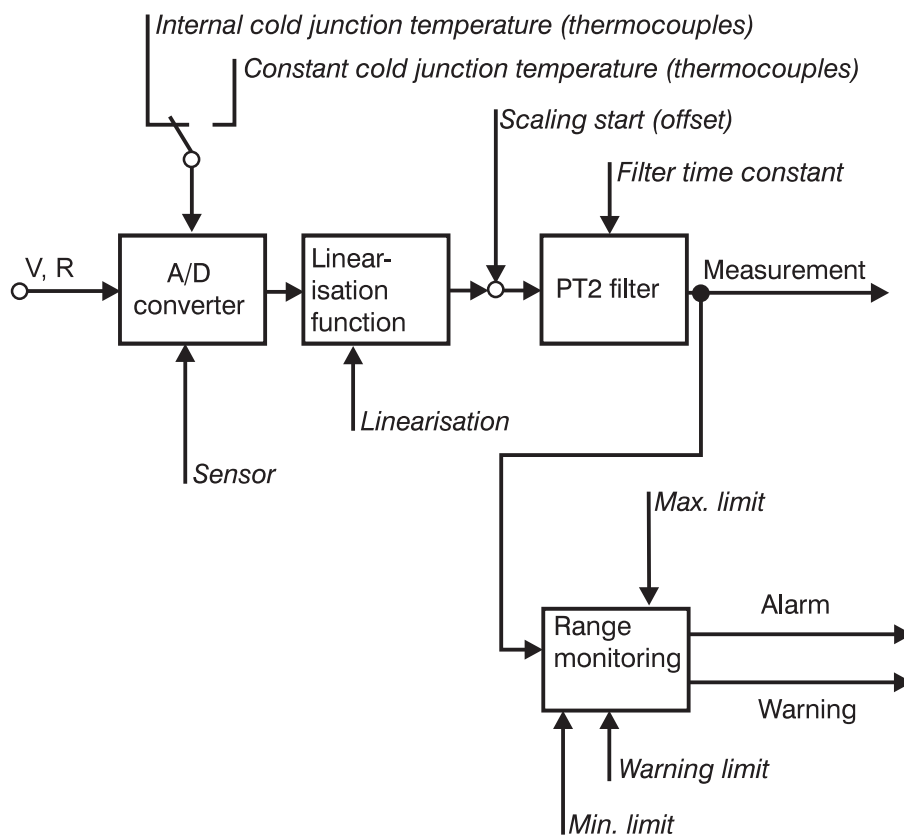
The block structure shows the input and output signals of the function.



7 Parameter level

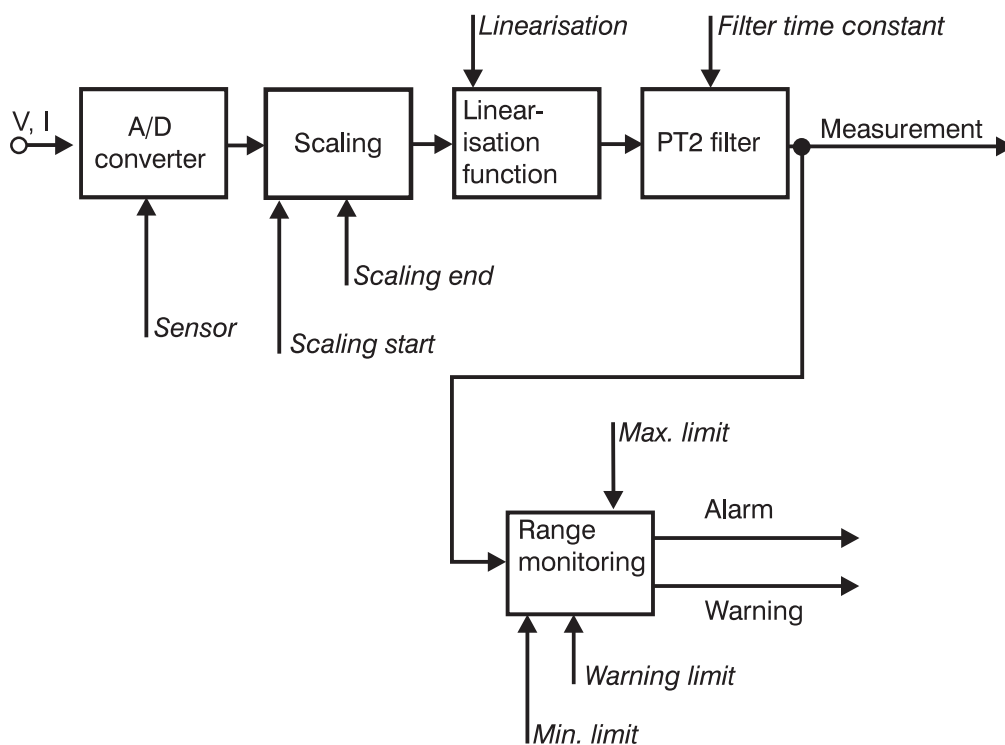
Block structure with thermocouple and resistance

The block diagram shows the signal flow when connecting thermocouples and resistances/resistance thermometers of the Pt100 type.



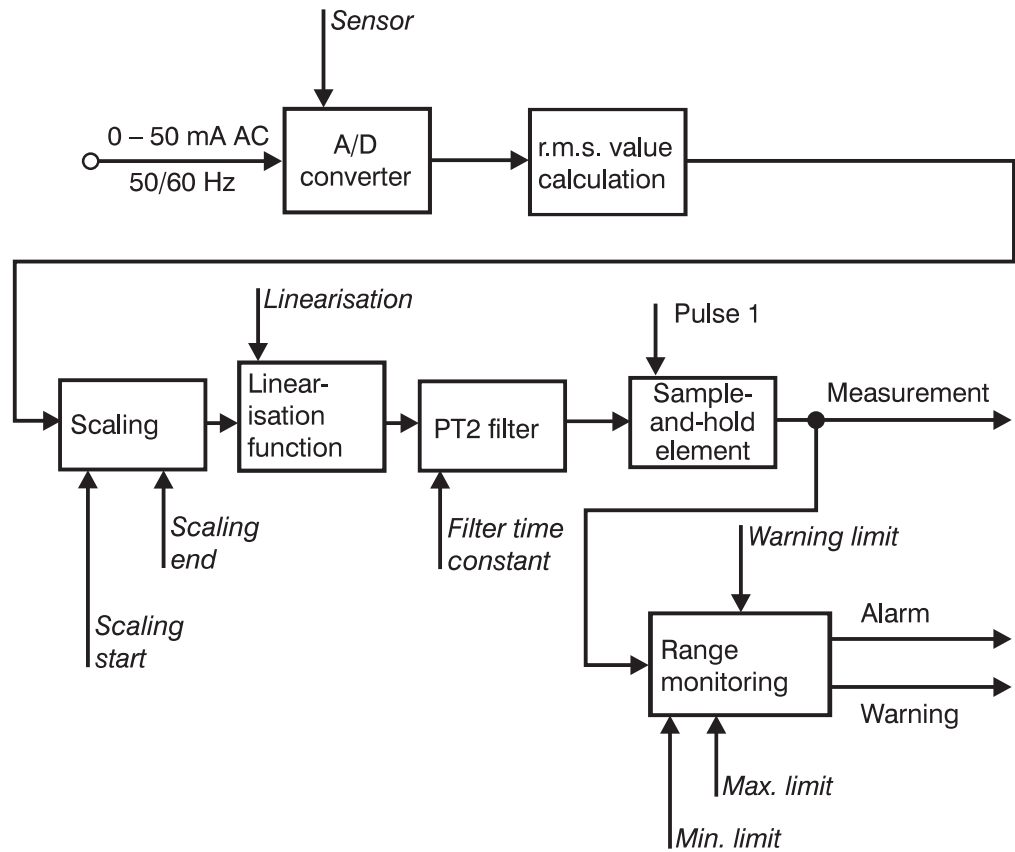
Block structure with standard signal and potentiometer

The block diagram shows the signal flow when connecting standard signals and potentiometers.



Block structure with AC current (heater current)

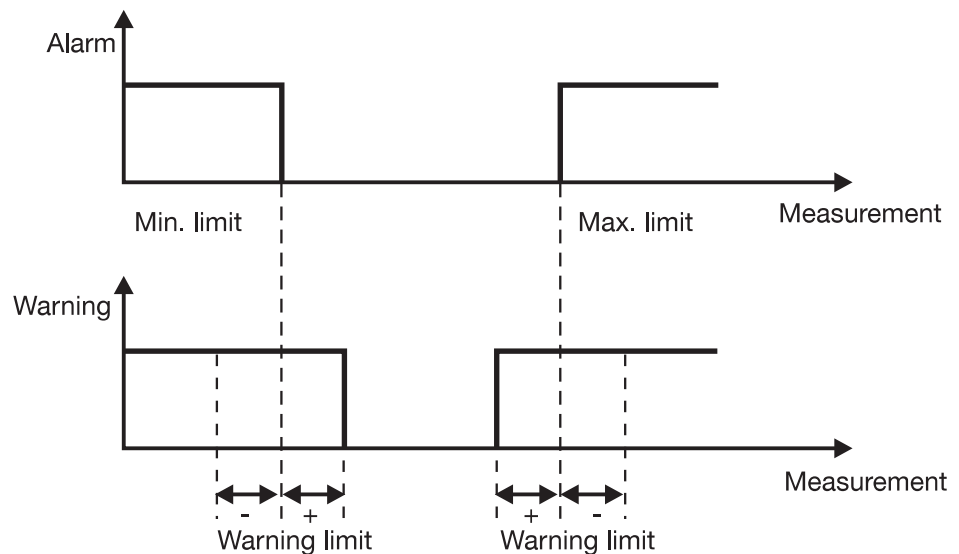
The block diagram shows the signal flow when connecting an AC current. An AC current can only be measured via the analogue input 2.



The AC current (heater current) is measured with the heating contact closed (operation via the pulse module 1 (pulse 1 = 1)). The measurement is held until the next measurement (sample-and-hold element).

Range monitoring

A range monitoring function is integrated into each of the analogue input functions. This function can be freely set via parameter to monitor the measurement. The alarm signals (Alx_alarm, Alx_warning) are available as output network-variables and can be used to link up with other functions.



7 Parameter level

Range monitoring On over/underrange of the selected current or voltage input range, the measurement itself is characterised as an invalid value by the “Out-of-Range” message, so that the operated functions can evaluate the invalid measurement. The table below shows on which sensor signals a sensor break is recognised and reported.

Transducer	Sensor break	Short-circuit	Max. overrange
Resistance thermometer	X	X	0 %
Thermocouples	X	–	0 %
0 – 50mV	X	–	+/-20 %
10 – 50mV	X	X	+/-20 %
-50 to +50mV	X	–	+/-10 %
0 – 10V	–	–	+/-20 %
2 – 10V	X	X	+/-20 %
-10 to +10V	–	–	+/-10 %
0 – 1V	–	–	+/-20 %
0.2 – 1V	X	X	+/-20 %
-1 to +1V	–	–	+/-10 %
0 – 20mA	–	–	+/-20 %
4 – 20mA	X	X	+/-20 %
AC 0 – 50mA	–	–	+/-10 %
Potentiometer	X (slider)	–	0 %

X = recognised

– = not recognised

Error handling In the event of a measurement error (e. g. sensor break),

- the alarm and warning alarm are activated and
- the measurement is set to “Out-of-Range” (invalid value).

7.1.3 Setpoints

There is a choice of four setpoints. In addition, an external setpoint can be implemented.

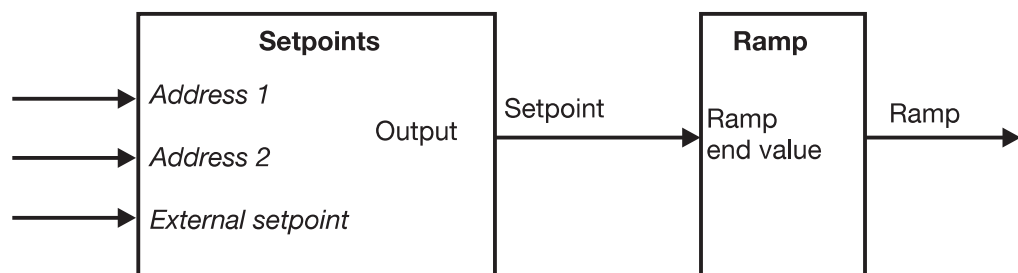
Parameters

Parameter	Selection/settings	Explanation
Unit [Unit]	(various) °C	Determines the physical units of the setpoints
Address 2 [SelAddress2]	Setpt_Addr1 [0] Setpt_Addr2 [1] Logic_In 1 [2] Logic_In 2 [3]	Determines via which signal sources the setpoints are selected
Address 1 [SelAddress1]	Setpt_Addr1 [0] Setpt_Addr2 [1] Logic_In 1 [2] Logic_In 2 [3]	
Setpoint 4 [Setpt 4]	-1999 to +9999 unit 0 unit	
Setpoint 3 [Setpt 3]		
Setpoint 2 [Setpt 2]		
Setpoint 1 [Setpt 1]		
External setpoint [SelExtSetp]	No function [0] Setpt_Ext [1] Anln1_Meas [2] Anln2_Meas [3]	The selected external setpoint is added to the given setpoint 1.

■ = factory setting [] = short name in the controller operating unit

Function

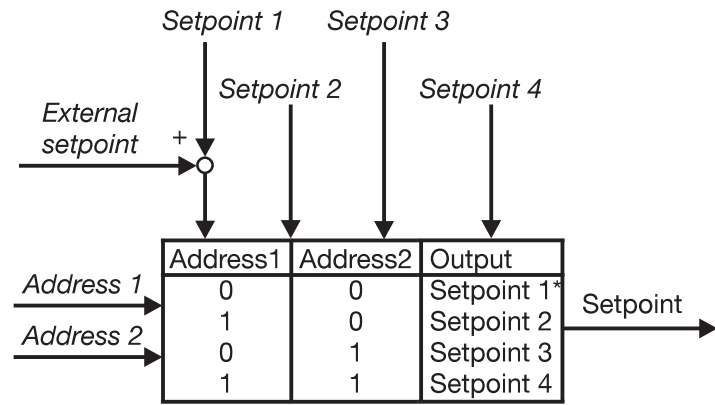
The diagram shows the input and output signals of the function. The output signal of the setpoint function is firmly linked to the ramp function. If the status of the ramp function is on “OFF”, the output signal of the setpoint function is passed straight through the ramp function.



7 Parameter level

Addressing setpoints

Setpoints are selected according to the table below:



setpoint 1* = setpoint 1 + external setpoint

Error handling

If the function input “External setpoint” is in the Out-of-Range condition, it is passed through to the output.

7.1.4 Ramp

A setpoint ramp with different gradients for rising and falling ramps can be implemented. The ramp profile can be influenced by different operating functions. In addition, the process value can be monitored with regard to the setpoint (stop comparator).

Parameters

Parameter	Selection/settings	Explanation
Start [SelStart]	Controller process value [0] Ramp_Start [1] Start profile [2]	Defines the start condition for the ramp With an active ramp reset, the ramp output equals the value of the ramp start.
Condition for stop [CondStop]	Window symmetrical [WinSym] Comparator high [CompHi] Comparator low [CompLow]	The selected stop function defines the process value range in which a ramp stop is active.
Off [SelOff]	Ramp_Off [0] Logic input 1 [1] Logic input 2 [2]	The ramp output corresponds to the ramp end, i.e. the preset setpoint.
Reset [SelReset]	Ramp_Reset [0] Logic input 1 [1] Logic input 2 [2]	The actual setpoint is set to the ramp start by the ramp reset.
Stop [SelStop]	Ramp_Stop [0] Logic input 1 [1] Logic input 2 [2]	External signal which stops the ramp output. In addition, the stop comparator compares the control variable (process value) with the actual ramp output. The ramp is stopped if the control variable is outside the preset range.
Ramp function [RampFunct]	Off [Off] Ramp active [RampAct] Ramp active with ramp stop [RampStp]	Altogether two ramp types can be activated.
Difference for stop [DiffStop]	0 – 9999 unit 0.5 unit	Defines the limit value for ramp with ramp stop
Unit gradient [UnitGrad]	1/min [1/min] 1/h [1/h] 1/day [1/day]	Defines the physical unit of the gradient
Gradient negative [GradntNeg]	-1999 – 0 unit -10 unit	These two variables determine the speed of the ramp change. The parameter “Gradient positive” is active when: ramp output < ramp end. The parameter “Gradient negative” is active when: ramp output > ramp end.
Gradient positive [GradntPos]	0 – 99990 unit 10 unit	
Profile start [Start]	-1999 to +9999 unit 0 unit	Defines a value for the ramp start

■ = factory setting [] = short name in the controller operating unit

“Ramp off” function

The diagram shows the input and output signals of the function when the ramp function is on “OFF”.

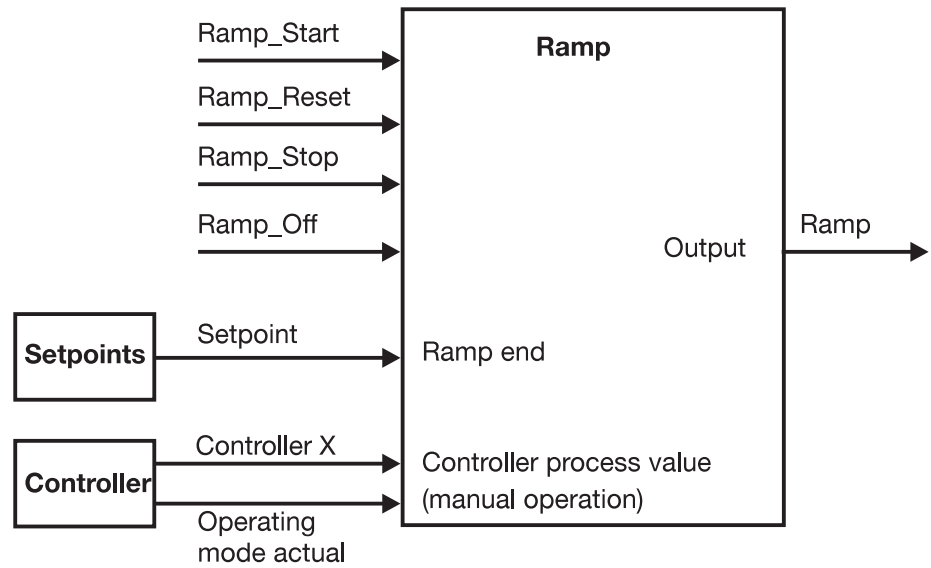
The “actual” setpoint is looped through and appears at the output (ramp).



7 Parameter level

**“Ramp active”
function
with/without
ramp stop**

The diagram shows the input and output signals of the function when the ramp function is active.



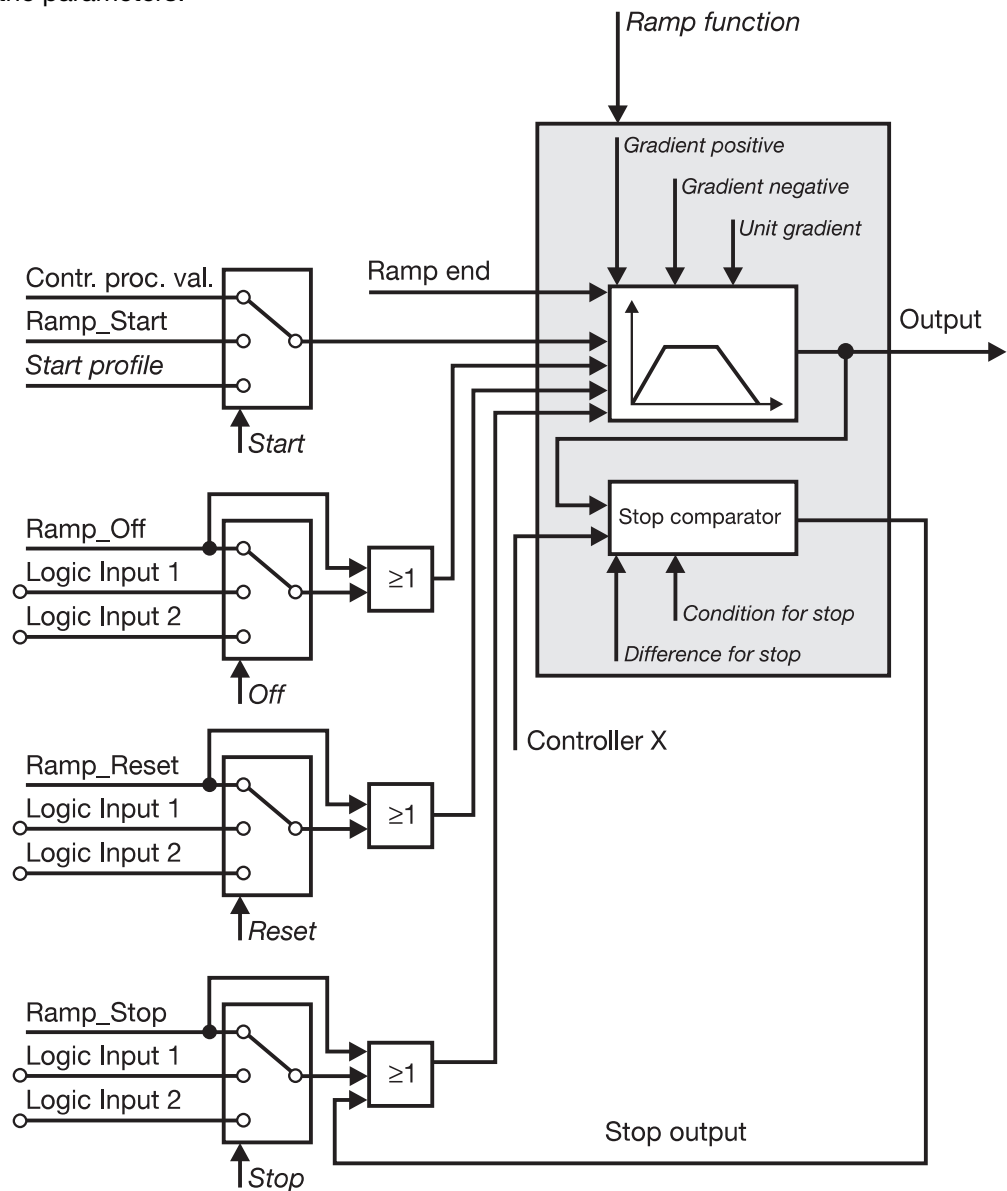
If the controller is in manual operation, the output of the ramp function is set to the process value.

The ramp end value is fixed by the setpoint function.

7 Parameter level

Block structure

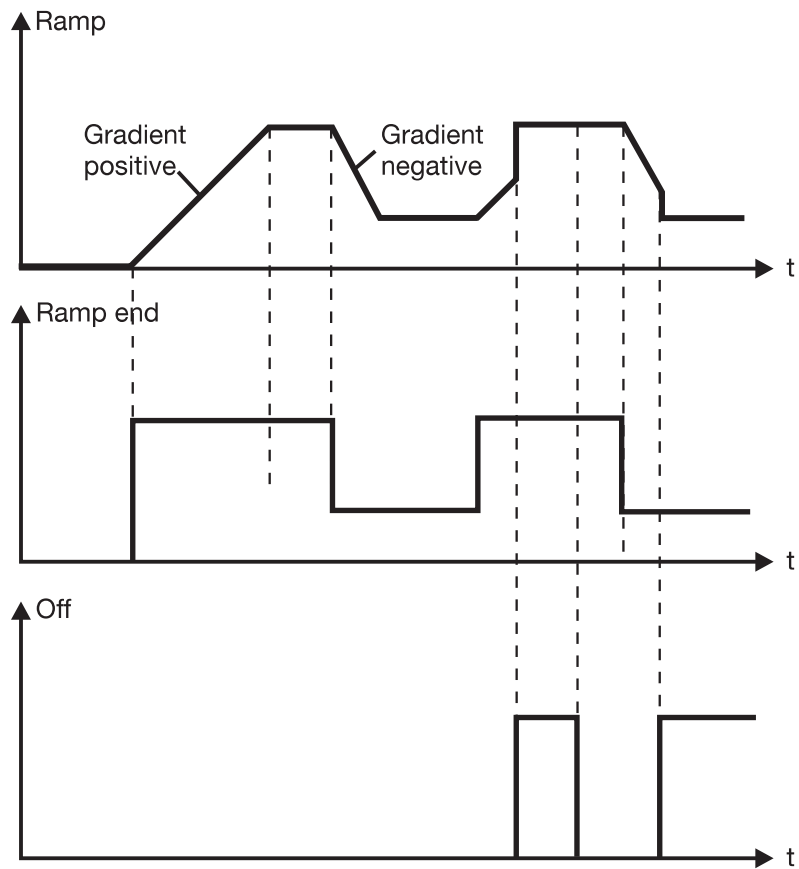
The block structure shows the internal processing of the signals and the influence of the parameters.



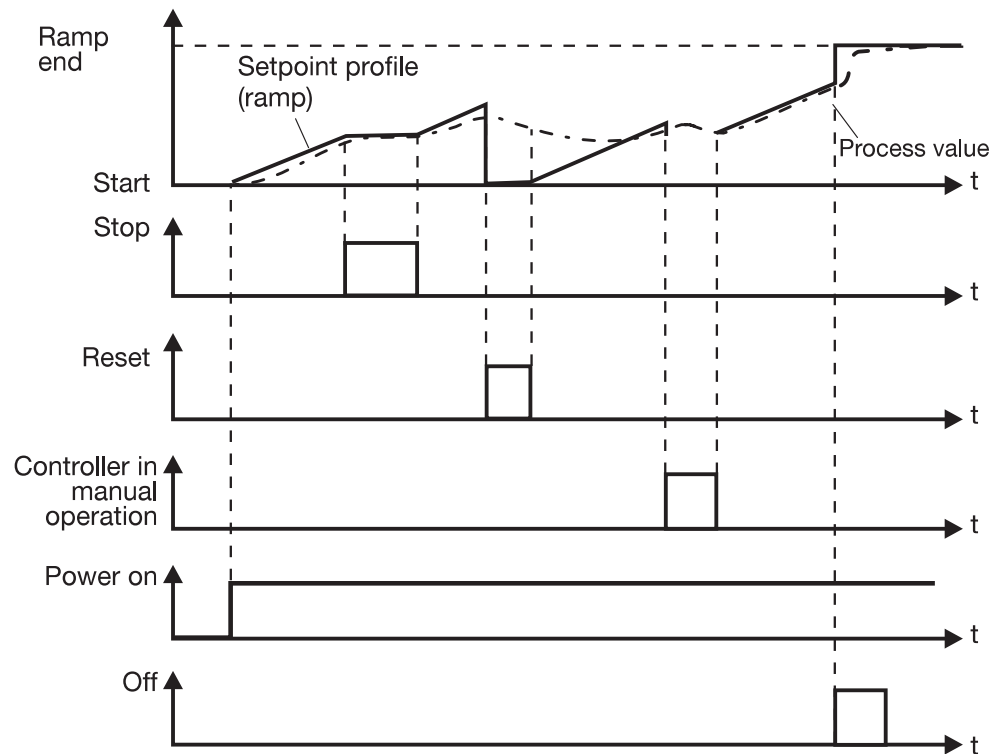
7 Parameter level

Ramp profile

On a setpoint change (ramp end), the parameters *Gradient positive/negative* become effective in the following way:

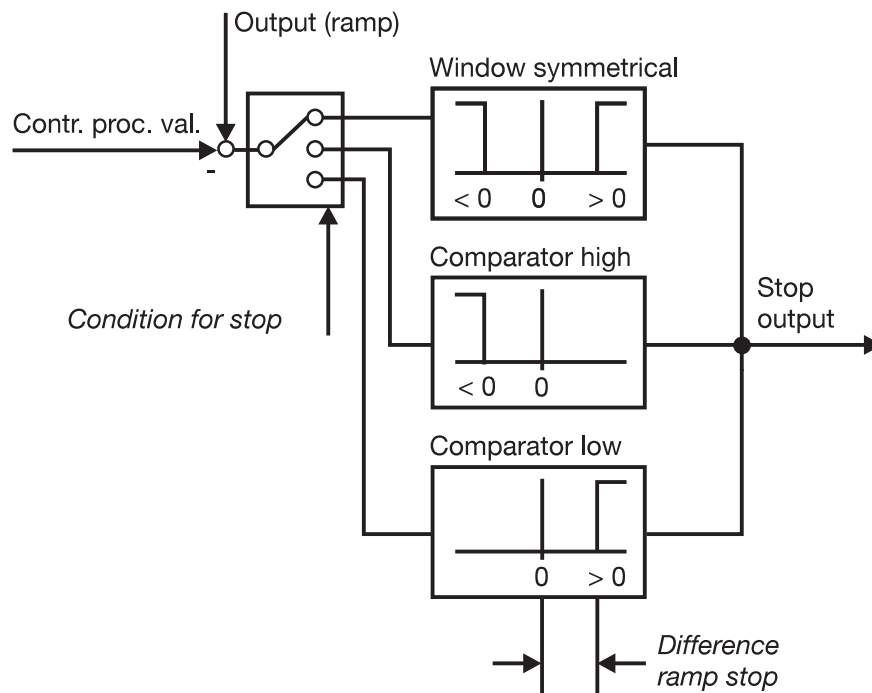


The diagram below shows the ramp profile with different operating functions and module conditions.



Ramp active with stop comparator

The progress of the process value along the ramp profile can be monitored by the selectable comparators which are available. Using the parameter *Difference for ramp stop*, the distance to the ramp output signal can be set.



Error handling

Source	Response of "Output ramp" on Out-of-Range
Start	- Output produces <i>Profile start</i> in the event of a (ramp) reset
Ramp end value	- Output is set to Out-of-Range When the error has been corrected, the output is set to the controller process value.
Controller process value	- Ramp output is Out-of-Range When the error has been corrected, the ramp function outputs the following value if <ul style="list-style-type: none"> - a (ramp) stop has been activated → <i>Profile start</i> - a (ramp) reset has been activated → <i>Profile start</i> - a (ramp) Off has been activated → <i>Ramp end</i> - manual operation has been activated → <i>Ramp setpoint = process value</i>

7 Parameter level

7.1.5 Controller

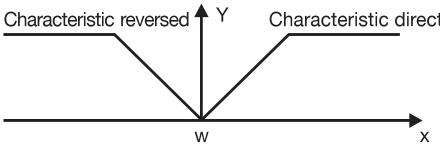
Different controller types can be configured here.

Parameters

Parameter	Selection/settings	Explanation
Controller type [ContrType]	1-setp. controller/ prop. controller [1SptCon] 2-setpoint controller [2SptCon] Modulating controller [ModCon] Prop. controller with act. driver [ActCont]	The functionality of the controller is defined here. The controller types are described below.
Out of Range output [SelOutROut]	Manual output prog. [0]	Signal source for output which is produced in the event of process value or setpoint errors
Manual output [SelManOut]	Contr_ManOut [0] Controller output [1] Manual output prog. [2]	Signal source for the control output in manual operation
Manual operation [SelManOp]	Contr_Manual [0] Logic input 1 [1] Logic input 2 [2] Operating unit [3]	Signal source for changeover to manual operation ⇒ "Manual operation"
Controller output retransmission [SelOutRetr]	No function [0] AnIn2_Meas [1] Contr_OutRetr [2]	Signal source for output retransmission on modulating controllers and proportional controllers with integral actuator driver
Controller parameter set [NrActPara]	[0] [1]	Active parameter set for controller
Parameter set selection [SelParSeln]	Contr_Para [0] Logic input 1 [1] Logic input 2 [2] Operating unit [3]	Signal source for parameter set switching
Manual output prog. [ManOutProg]	-100 to +100 % 0 %	Fixed controller output which is to be output in manual operation
Operating mode actual [OperAct]	[Man.] [Auto]	The current operating mode appears here
Operating mode set [OperSet]	[Man.] [Auto]	The setting for manual operation [SelManOp] must be on [3]. Then it is possible to change over from "Manual" to "Auto" via the controller operating unit.
Process value [SelProcVal]	AnIn1_Meas [0] AnIn2_Meas [1] Maths [2] Contr_ExtPV [3]	Signal source for the controller process value.
Setpoint [SelSetpt]	Ramp [0] Maths [1] Setpoint [2]	Signal source for the controller setpoint.

■ = factory setting [] = short name in the controller operating unit

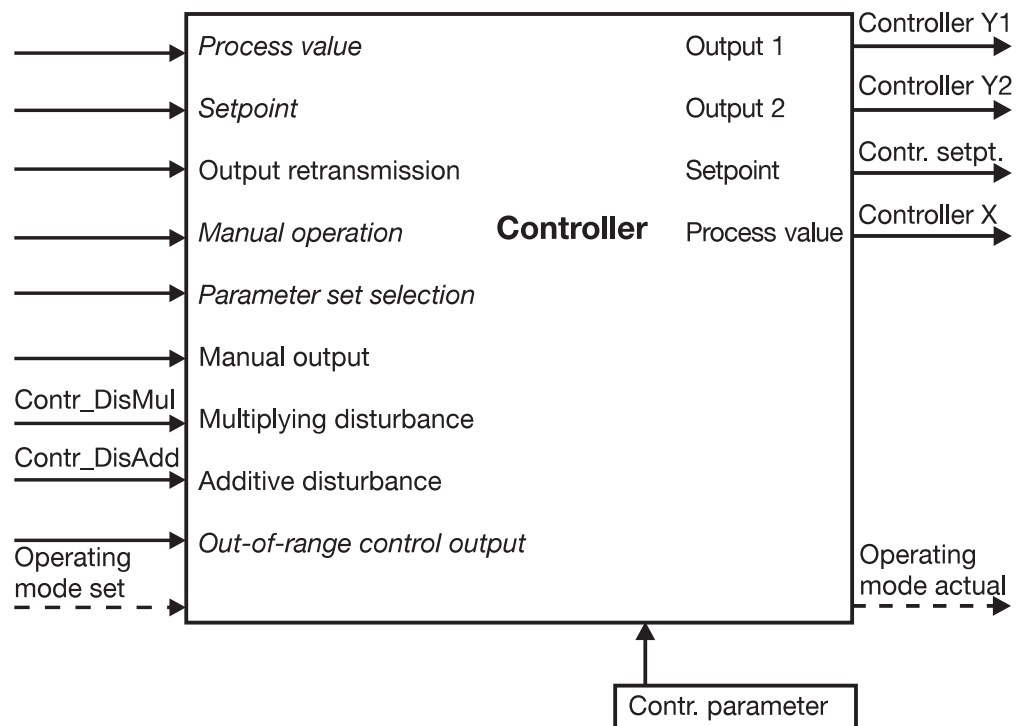
7 Parameter level

Parameter	Selection/settings	Explanation
Characteristic [Charistic]	Direct (cooling) [Direct] Reversed (heating) [Reversd]	Defines the controller characteristic  <p>With the setting "Characteristic reversed" the control deviation (xw) is formed from $w - x$. The output Y of the controller is > 0, if the process value is smaller than the setpoint. If the characteristic is switched to "Characteristic direct", then the controller output Y is > 0 if the process value is larger than the setpoint.</p>
Controller structure [Structure]	P [P] I [I] PD [PD] PI [PI] PID [PID]	Transfer characteristic of the controller for controlling the process

■ = factory setting [] = short name in the controller operating unit

Function

The diagram shows the input and output signals of the function.



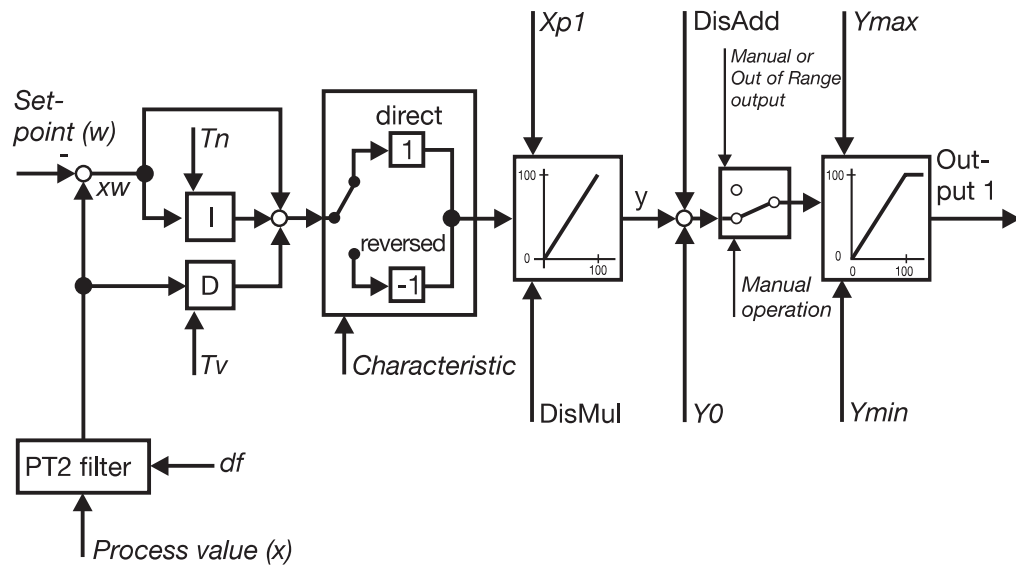
⇒ Section 7.1.8 "Controller parameters"

Proportional controller

The block structure shows the internal processing of the signals and the influence of the parameters with proportional controllers.

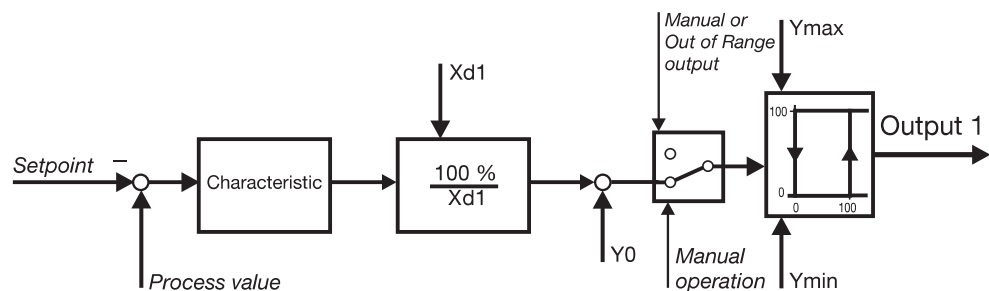
⇒ "Additive disturbance"
 "Multiplying disturbance"

7 Parameter level



Proportional controller with $Xp1 = 0$

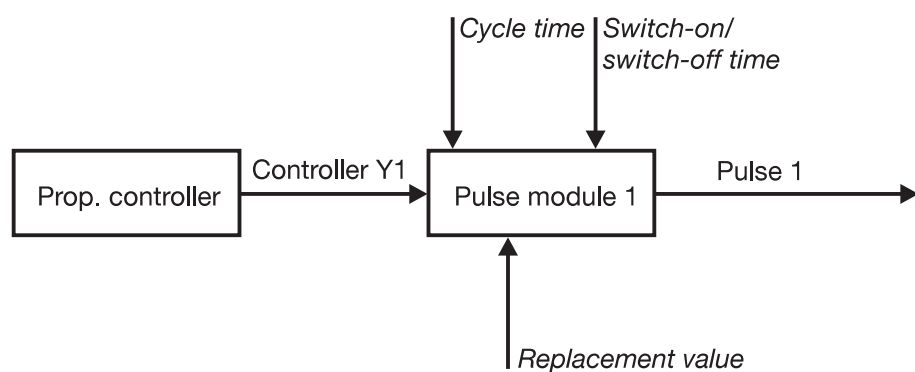
The block structure shows the internal processing of the signals and the influence of the parameters with proportional controllers with $Xp1 = 0$.



1-setpoint controller

The block structure shows the internal processing of the signals and the influence of the parameters with 1-setpoint controllers. The analogue controller output signal is converted to switching pulses by a pulse module.

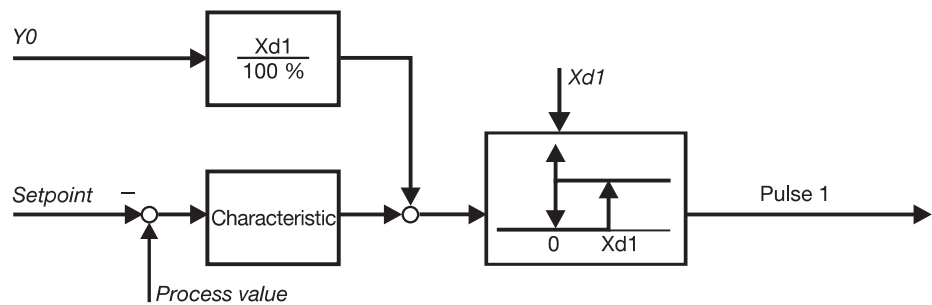
⇒ Section 7.1.9 "Pulse module"



7 Parameter level

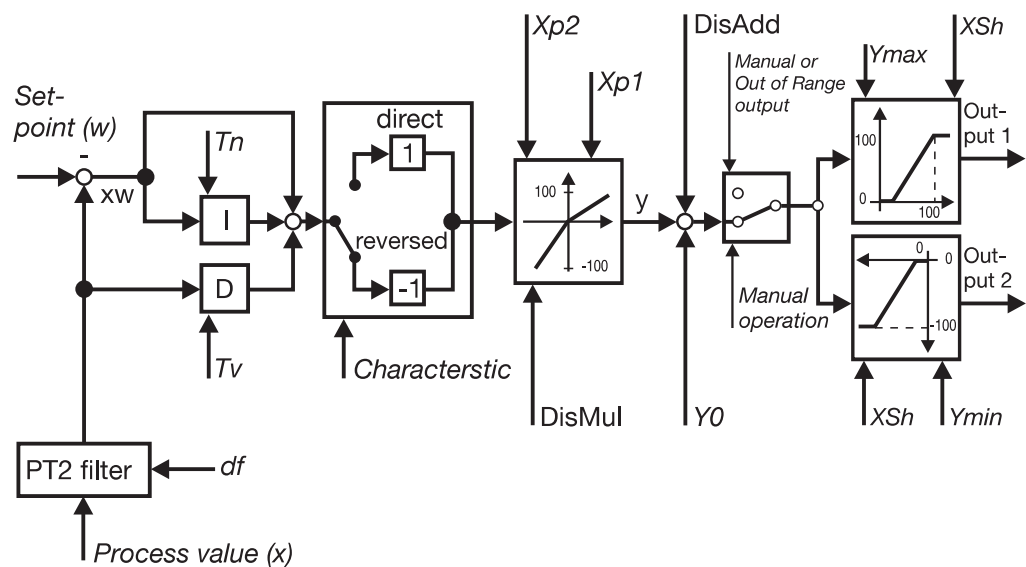
1-setpoint controller with $Xp1 = 0$

The block structure shows the internal processing of the signals and the influence of the parameters for 1-setpoint controllers with $Xp = 0$.



2-setpoint controller

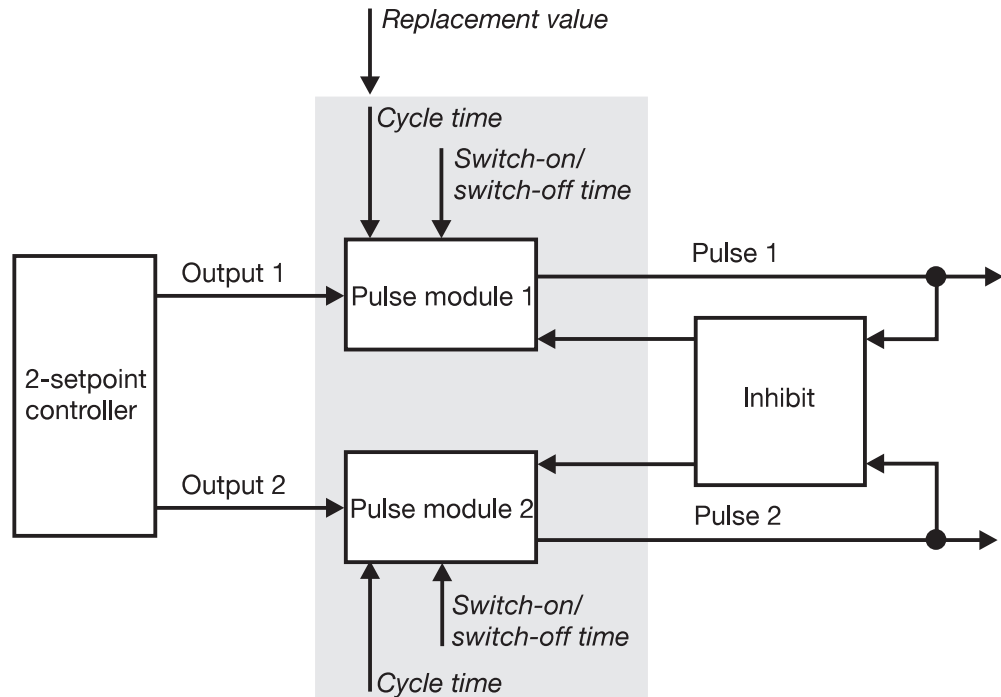
The block structure shows the internal processing of the signals and the influence of the parameters for 2-setpoint controllers.



The preset value for the contact spacing XSh (dead band) refers to the control deviation xw . It affects the output limiting by an amount of $XSh/2 \cdot 100\%/Xp$.

$$Xp = \begin{cases} Xp1 & \text{with output 1} \\ Xp2 & \text{with output 2} \end{cases}$$

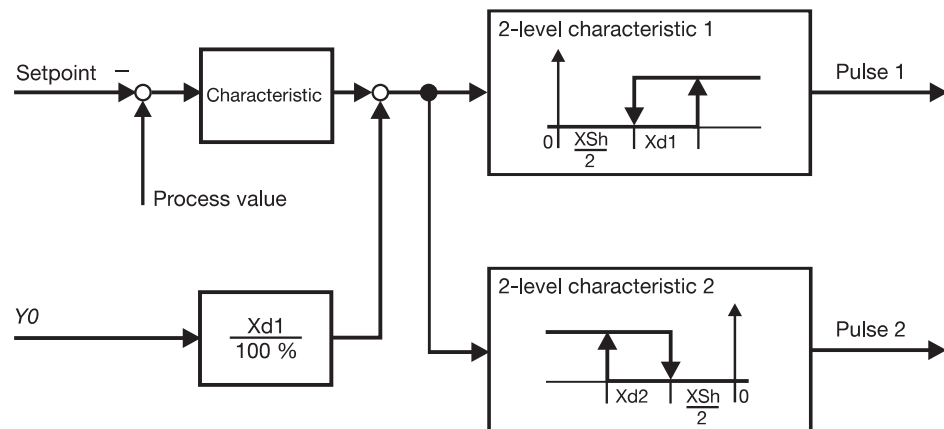
7 Parameter level



The inhibit prevents the status pulse 1 = pulse 2 = 1.
The replacement value is set on pulse module 1.

Double-setpoint controller with $X_{p1} = 0$ and $X_{p2} = 0$

The block structure shows the internal processing of the signals and the influence of the parameters for double-setpoint controllers without a feedback structure ($X_{p1} = X_{p2} = 0$).



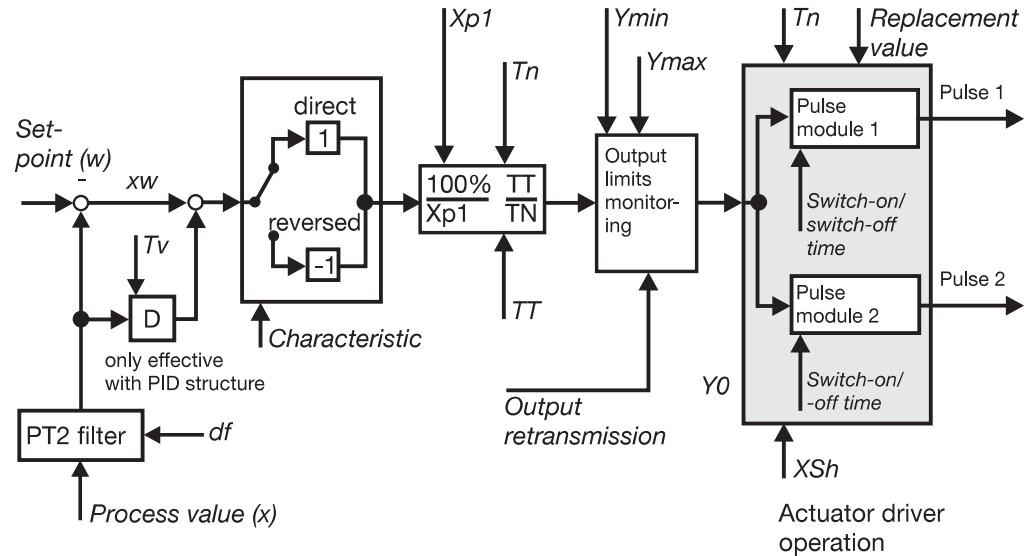
Further mixed structures can be set up for double-setpoint controllers, e.g.

- $X_{p1} > 0$ and $X_{p2} > 0$
- $X_{p1} = 0$ and $X_{p2} > 0$
- $X_{p1} > 0$ and $X_{p2} = 0$

The corresponding functional sections of the block structures will then be active.

Modulating controller

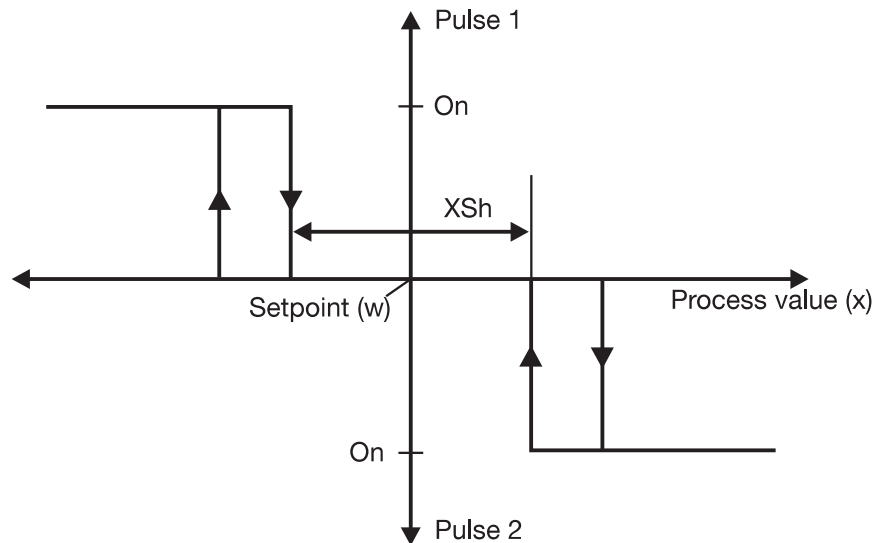
The block structure shows the internal processing of the signals and the influence of the parameters for modulating controllers.



When the integrating effect of the actuator motor is considered, the result is a PI or PID response for the control system.

⇒ Section 7.1.9 "Pulse module"

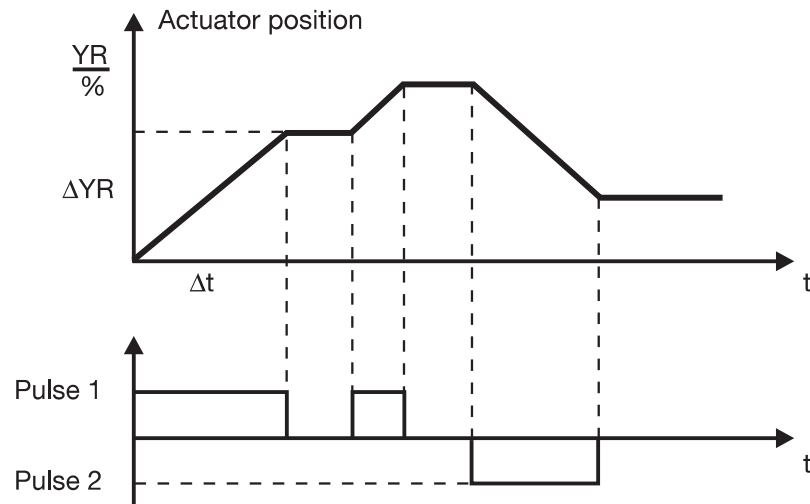
Static characteristic of the actuator operation



The value set for the contact spacing XSh (dead band) refers to the control deviation xw .

7 Parameter level

Apart from the effect of the D-element, the control deviation (xw) must lie outside the dead band, so that pulses can be produced.

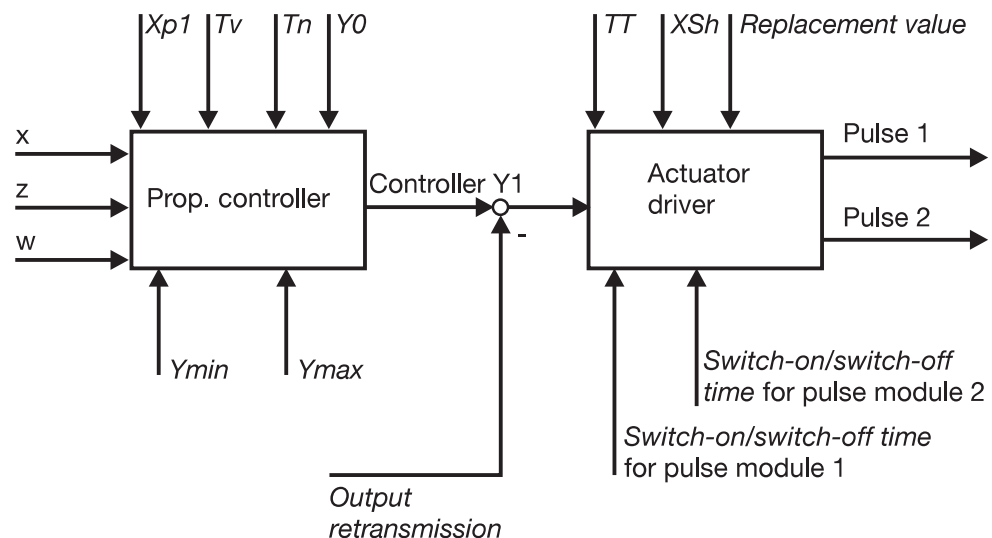


$$\frac{\Delta YR}{\Delta t} = \frac{100}{TT}$$

YR - output retransmission

Proportional controller with integral actuator driver

The block structure shows the internal processing of the signals and the influence of the parameters for a proportional controller with integral actuator driver.



The advantages of the actuator driver:

An actuating controller has the advantage over a modulating controller of providing a subordinate control loop. If a control deviation occurs, the actuator driver runs the motor to a new position. This is achieved by comparing the actuator position with the controller output of the proportional controller. An actuating controller is more dynamic than a modulating controller in correcting a control deviation. The subordinate control loop, consisting of the actuator driver and the motor actuator, forms a PDT_1 transfer function. This control loop can be adjusted by the value entered for the actuator stroke time TT . In this case, the setting and effect of the parameter XSh refers to the output difference, not the control deviation. With an entered value of, for instance, 3% for XSh , no further pulses will appear in a range of $\pm 1.5\%$ about the output variable (output1) (see "Modulating controller").

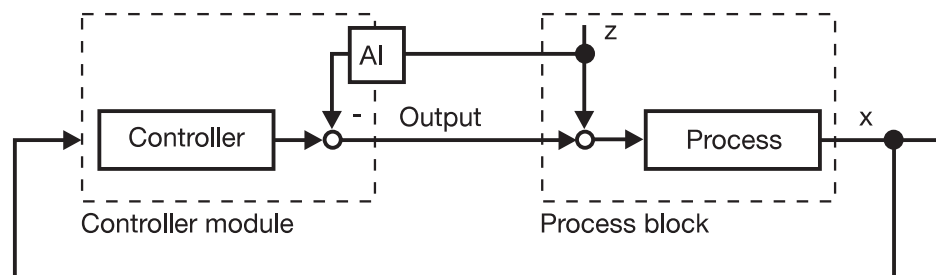
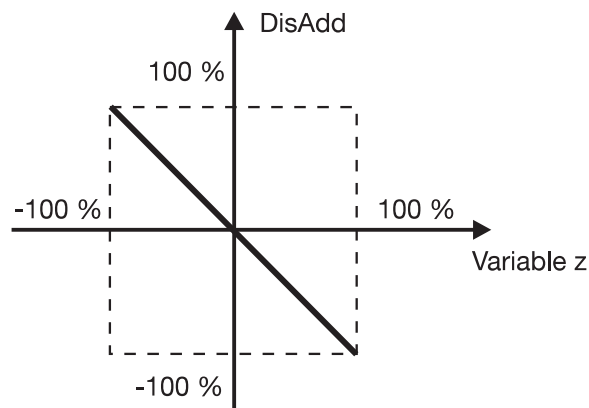
Error handling

Source	Response on Out-of-Range
Process value	- Produces an <i>Out-of-Range output</i>
Setpoint	- Produces an <i>Out-of-Range output</i>
Output retransmission	- Output corresponds to the replacement value of the pulse module (only with actuating controllers!)
Manual output	- Output of <i>Manual output prog.</i> (only in manual mode!)
Additive disturbance	- Disturbance correction inactive
Multiplying disturbance	- Disturbance correction inactive

7.1.6 Disturbance correction

Additive disturbance correction

The additive disturbance correction (DisAdd) has the effect of shifting the output relative to the controller output variable (Y) and the preset working point (Y₀). The additive disturbance correction is made so that it compensates for the disturbing influence (z) acting on the input of the process. In order to achieve this compensation of the disturbance, the DisAdd signal must be equal to the disturbance z, but of opposite sign. The dimension of the DisAdd signal is scaled as % of the shift in the output.



Multiplying disturbance correction

The multiplying disturbance correction alters the gain factor in the transfer function of the controller. This makes it possible to adjust the controller gain to match a varying process amplification. To do this, it must be possible to measure the change of amplification in the process.

The gain factor (K_p) can be calculated from the preset proportional band (X_p) as

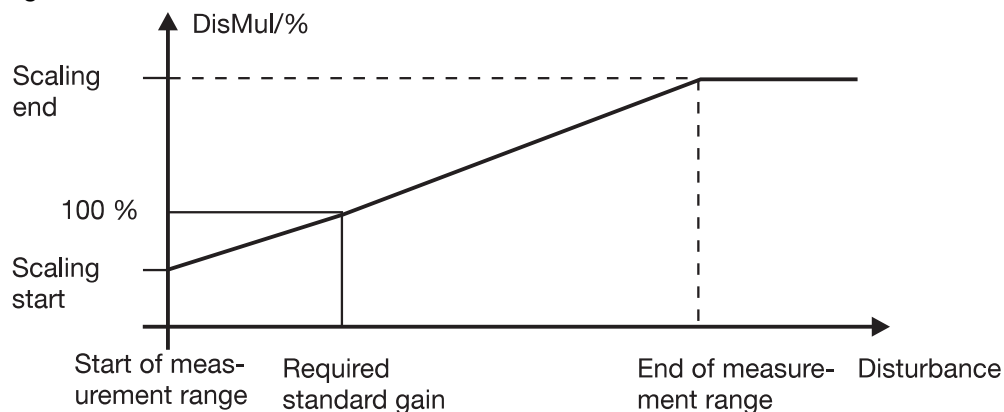
$$K_p = \frac{100\%}{X_p}$$

7 Parameter level

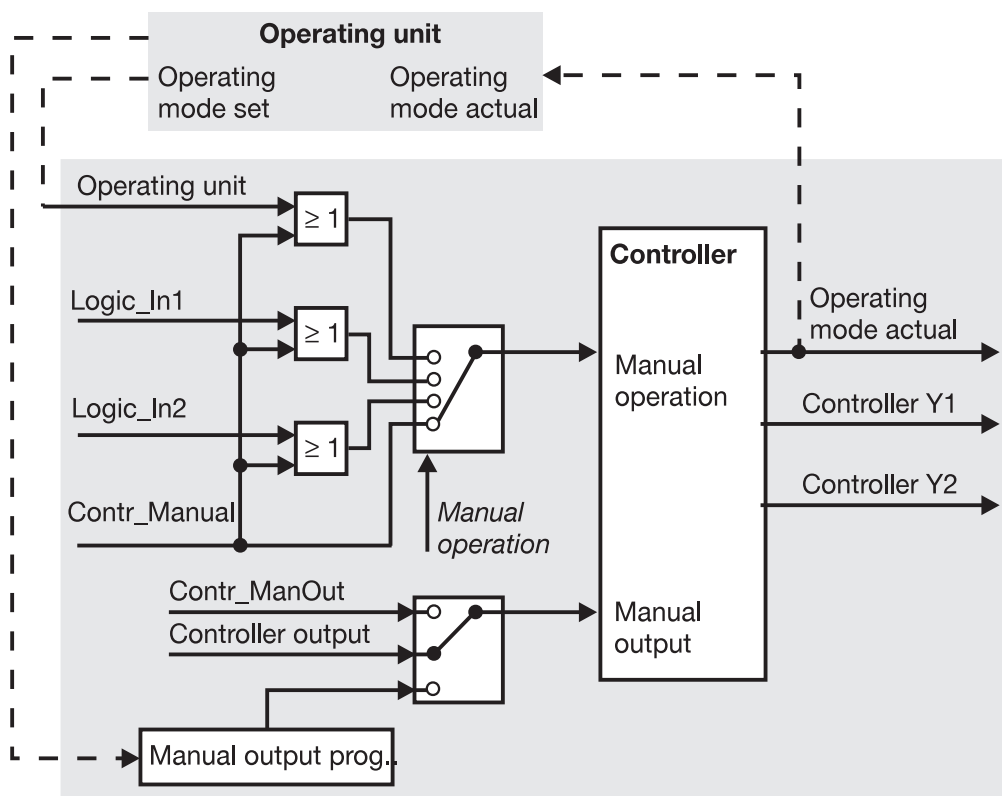
The signal input DisMul (0 — 1000 %) can be used to set the controller gain according to the relationship

$$K_p = \frac{\text{DisMul}}{X_p}$$

The dimension of the DisMul signal must be scaled in % of the desired normal controller gain. DisMul = 100 means that the disturbance correction is switched off.



Manual operation The diagram illustrates manual control, using an operating unit.



The controller can be changed over to manual mode by using the process variable “Operating mode set”. The process variable “Operating mode actual” can be used to read out the actual operating status of the controller. In process window 1 it is possible to change over from MAN. to AUTO.

⇒ See “Process window 1”

In addition, the parameter *Manual output prog.* can be provided through the operating unit.

⇒ See “Process window 3”

7.1.7 Self-optimisation

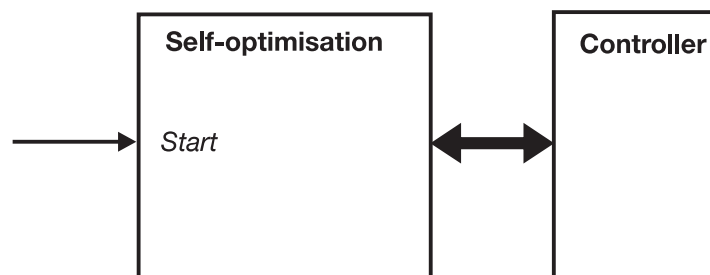
The self-optimisation function SO is a pure software function unit which is integrated into the controller. The SO uses a special procedure to investigate the response of the process to an output step. The process response (process value) of the control loop is then used in a complex algorithm to calculate and then store the controller parameters for a PID or PI controller. The SO procedure can be repeated as often as is required.

Parameter	Selection/ settings	Explanation
Start [SelStart]	Tune_Start [0] Logic input 1 [1] Logic input 2 [2] Operating unit [3]	Starts the self-optimisation
Output mode 2 [OutpMode]	Relay [Relay] Analogue [Analog] Semiconductor [Semicon]	The controller parameter are calculated according to the output mode.
Output mode 1 [OutpMode]	Relay [Relay] Analogue [Analog] Semiconductor [Semicon]	For relay outputs: the <i>Cycle time</i> parameter is calculated for the pulse modules. For semiconductor relay outputs: the <i>Cycle time</i> parameter is fixed at 8 x controller sampling time. For analogue outputs: there is no optimisation of the <i>Cycle time</i> parameter.
Start	No start of self-optimisation [no] Start self-optimisation [yes]	Starts the self-optimisation when “yes” is entered, if [3] has been configured for “Start”.

■ = factory setting [] = short name in the controller operating unit

Function

The diagram shows the input and output signals of the function.

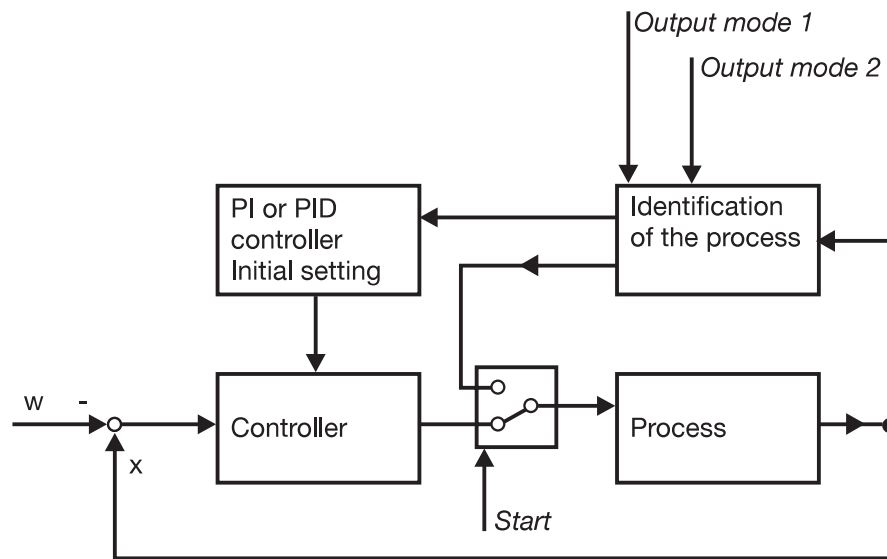


If a PI controller is configured, then the optimisation is for PI response. If a PID controller is configured, then a PI response is optimised for 1st order control loops, PID in other cases. For all other controller structures the configuration is optimised for PID response.

7 Parameter level

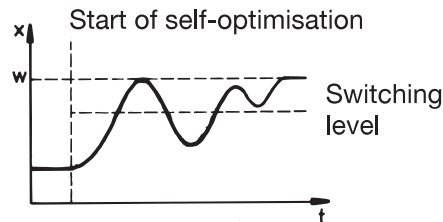
Block structure

The block structure shows the internal processing of the signals and the influence of the parameters.

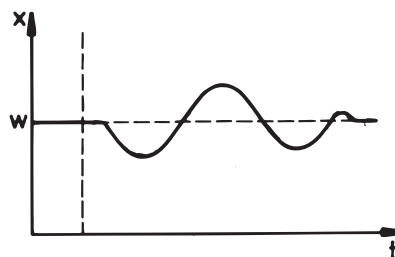


Self-optimisation procedure

The SO operates by two different methods which are automatically selected at the start, depending on the dynamic state of the process variable and its distance to the setpoint. The SO can be started from any dynamic state of the process value. If there is a large difference between the setpoint and the process value when the self-optimisation is activated, then a switching level is established, about which the control variable performs a forced oscillation during self-optimisation. The switching level is chosen so that the process value, as far as possible, does not exceed the setpoint.



If the control deviation between setpoint and process value is small, for instance when the control loop has already stabilised, then forced oscillations are made about the setpoint.

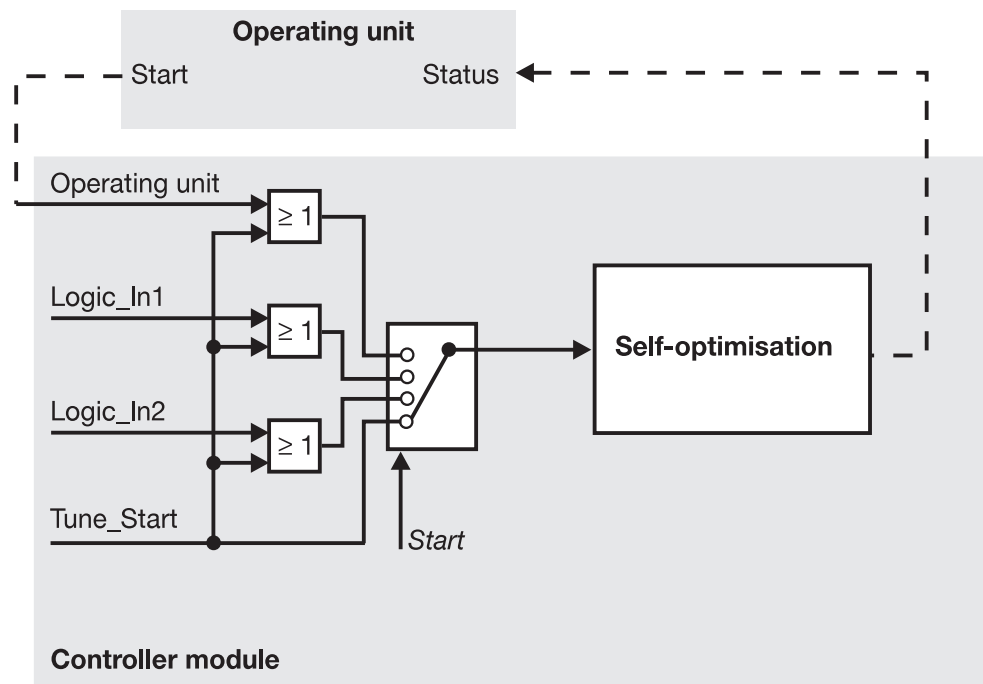


The recorded process data from this forced oscillation are used to calculate the controller parameters T_n , T_v , X_{p1} , X_{p2} , the cycle times for the pulse modules, an optimum controller structure for this control loop, as well as a filter time constant for filtering the process values, and to store them in the active parameter set.

If the second parameter set is selected, then only X_{p1} , X_{p2} , T_n und T_v are calculated.

Start from the operating unit

The diagram shows the control of the self-optimisation from an operating unit.



The process variable “Start” is used to start the self-optimisation. The “Status” process variable can be used to read out the actual state of the self-optimisation. The status appears in process window 1 (MAN./AUTO/TUNE).

⇒ Section 6.2 “Contents of the process window”

7.1.8 Controller parameters

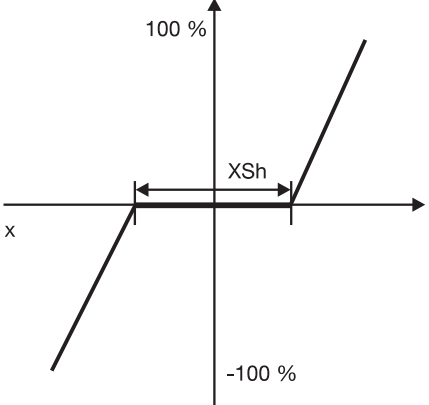
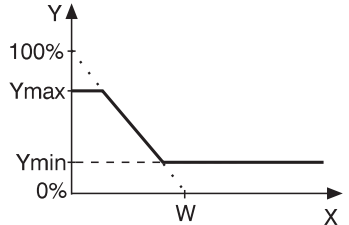
The controller is adapted to the control loop here. A choice of two parameter sets is available.

[ContrPar1],
[ContrPar2]

Parameter	Selection/settings	Explanation
Xp1 [Xp1]	0 — 9999 unit 10.00 unit	P range (proportional band) The proportional band (Xp) ist the control deviation range for a 100% change in the output. $Y = \Sigma (P, I, D) \cdot \frac{100\%}{X_p}$ P, I, D components as functions of the control deviation The proportional band has the same dimension as the process value.
df [FiltTime]	0 — 40 s 0 s	Filter time constant 1 (PT2 element): Value of the digital filter for smoothing the process value in the controller function
T0 [SamplTim]	n x 420ms 0.42s	Controller sampling time: Time period for the determination of the process value

■ = factory setting [] = short name in the controller operating unit

7 Parameter level

Parameter	Selection/settings	Explanation
TT [TT]	15 — 9999 s 60 s	The stroke time TT is the time which the actuator requires to move over the range of 0 — 100 %.
XSh [XSh]	-1999 to +9999 unit 0.000 unit	Dead band The range of control deviation in which no controller output is produced 
Xd2 [Xd2]	0 — 9999 unit 1.000 unit	Switching differential For controllers with $X_p = 0$ the switching differential influences the amount of variation of the process value about the setpoint.
Xd1 [Xd1]	0 — 9999 unit 1.000 unit	Apart from this, these parameters have no effect.
Ymax [Ymax]	0 — 100 % 100 %	Controller output limiting A controller output limiting is used to limit the controller output signal to a maximum (Y_{max}) or minimum (Y_{min}) value.
Ymin [Ymin]	-100 to +100 % 0 %	Example: proportional controller 
Y0 [Y0]	-100 to +100 % 0 %	Working point For P and PD controllers: defines the output when $x = w$. For controllers with an I component: Y0 defines the first output which is produced after switching on the supply voltage.

■ = factory setting [] = short name in the controller operating unit

7 Parameter level

Parameter	Selection/settings	Explanation
Tv [Tv]	0 — 9999 s	Derivative time
	80 s	Is the time period by which the rising response of a PD controller structure reaches a certain output value in advance of a P controller structure
Tn [Tn]	0 — 9999 s	Reset time
	350 s	Is the time which is required, because of the integrating action, to respond to a step change to reach the same change in output as for the P component
Xp2 [Xp2]	0 — 9999 unit	see parameter Xp1
	10.00 unit	

■ = factory setting [] = short name in the controller operating unit

7.1.9 Pulse module

The two pulse modules convert continuous output signals into switching pulses.

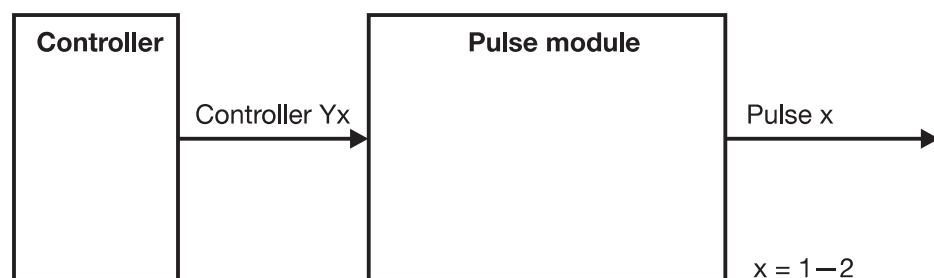
[PulseMod1],
[PulseMod2]

Parameter	Selection/settings	Explanation
Cycle time [CycleTim]	1 — 999.9s	Cycle time of the switching pulses.
	20.0s	
On/off time [TOn/Off]	0 — 60s	This parameter defines the minimum length of the pulse which is output, and also the minimum pause which is made between pulses. Used to protect the actuators
	0.0s	
Replacement value [ReplVal]	0 — 100%	A defined output for the event of a faulty input signal
	0%	

■ = factory setting [] = short name in the controller operating unit

Function

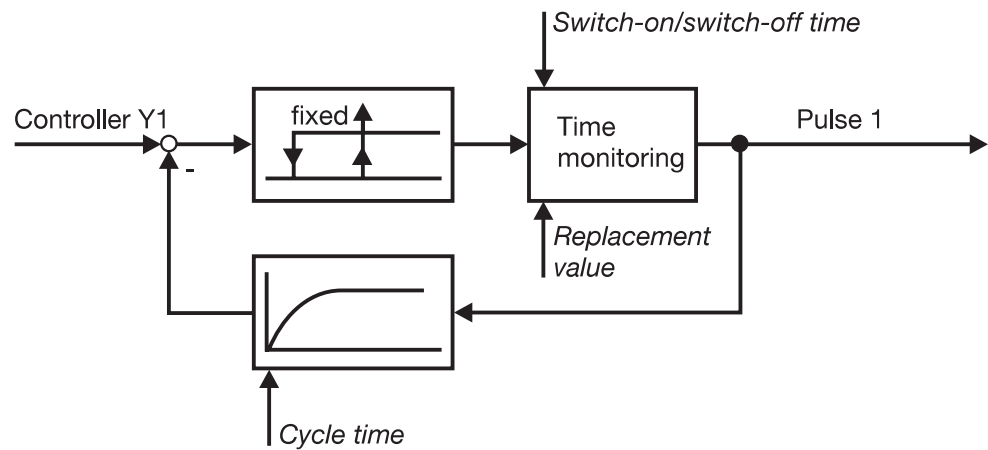
The diagram shows the input and output signals of the function.



7 Parameter level

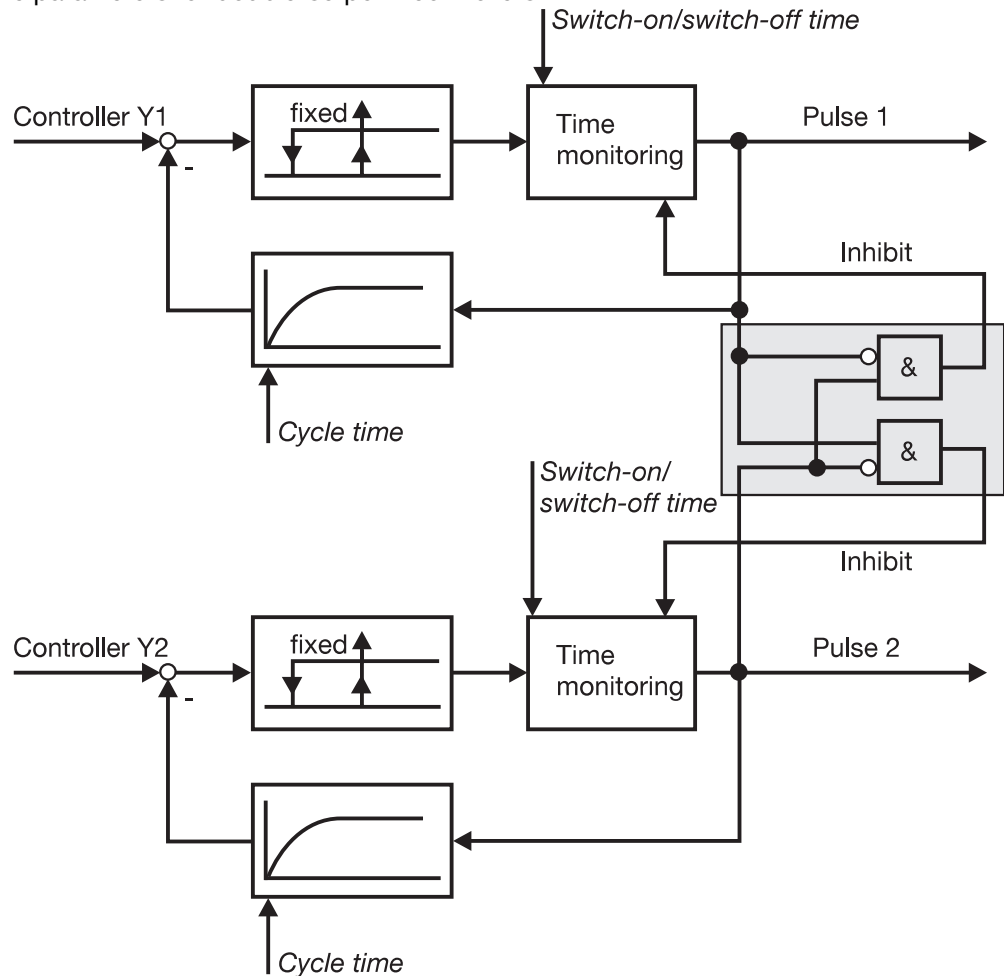
Block structure for 1-setpoint controllers

The block structure shows the internal processing of the signals and the influence of the parameters for single-setpoint controllers.



Block structure for 2-setpoint controllers

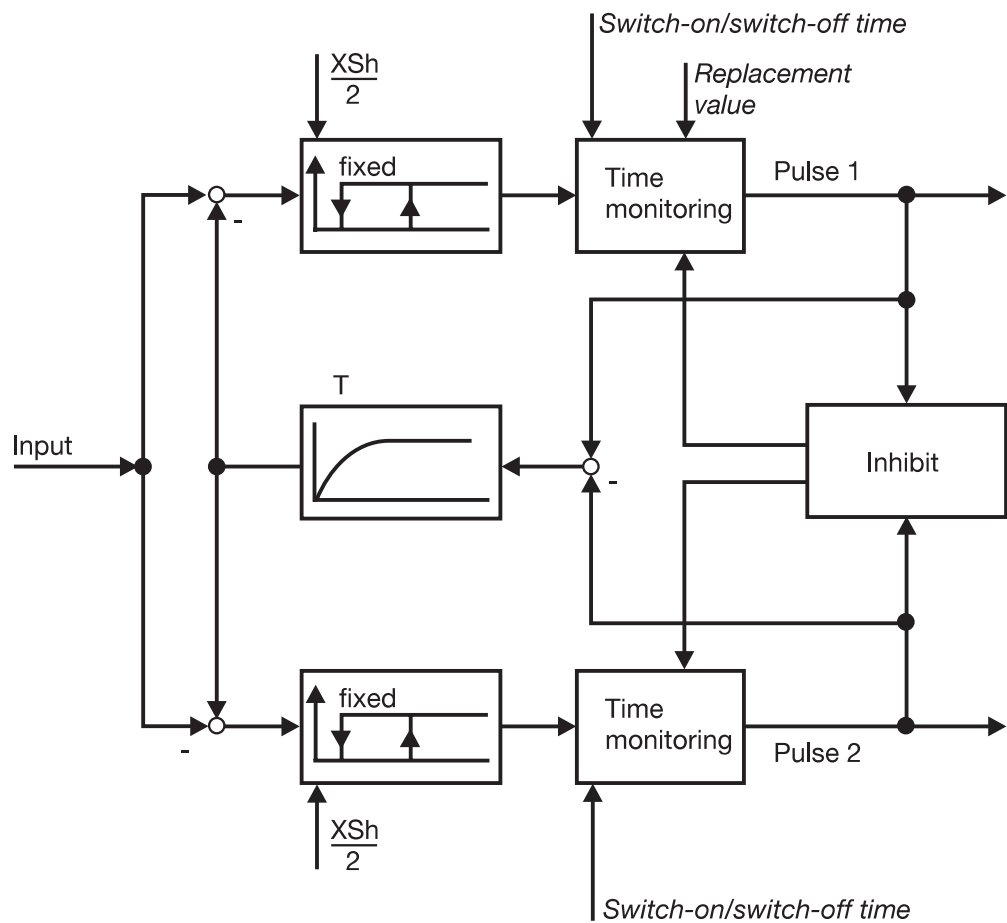
The block structure shows the internal processing of the signals and the influence of the parameters for double-setpoint controllers.



7 Parameter level

Block structure for modulating and actuating controllers

The block structure shows the internal processing of the signals and the influence of the parameters for modulating controllers, and for 2-setpoint controllers with an integral actuator driver.



XSh - Contact spacing (dead band)

⇒ Section 7.1.8 "Controller parameters"

7 Parameter level

7.1.10 Mathematics

Two analogue input values can be combined in a mathematical formula.

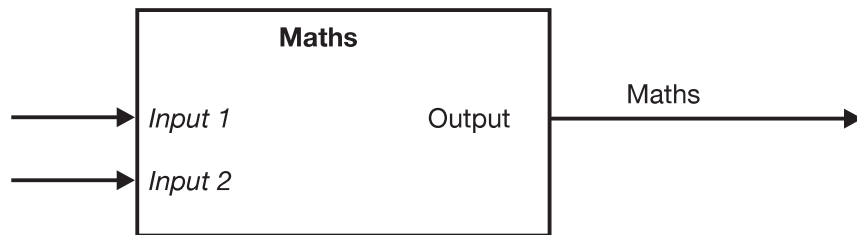
Parameter	Selection/settings	Explanation
Min. limit [MinLimit]	-1999 to +9999	Limits for the replacement value strategy
	-1999	
Max. limit [MaxLimit]	-1999 to +9999	
	9999	
Formula [Formula]	Difference (a - b) [Diff] Humidity (a : wet, b : dry) [Hum] Ratio (a/b) [Ratio] Square root (a) [Root] Square (a) [Square] Minimum (a, b) [Minimum] Maximum (a, b) [Maximum] Absolute value (a) [Absolut] Sum (a + b) [Sum] Product (a · b) [Product] Average (a, b) [Average]	Mathematical function Humidity measurement by the psychrometric method
Input 1 [SelInput1]	AnIn1_Meas [0] AnIn2_Meas [1] Exter_In [2] Setpoint [3] Ramp [4] Controller Y1 [5] Controller Y2 [6]	Variable a
Input 2 [SelInput]	AnIn1_Meas [0] AnIn2_Meas [1] Exter_In [2] Setpoint [3] Ramp [4] Controller Y1 [5] Controller Y2 [6]	Variable b
Replacement value strategy [ReplVStrat]	Limitation to limits [Limit] Out-of-Range [OutRnge]	Limitation to limits: The output signal is limited to the limits or, in the event of a faulty input signal, is set to Out-of-Range. Out-of-Range: If limits are exceeded, the output signal is set to Out-of-Range.

■ = factory setting [] = short name in the controller operating unit

7 Parameter level

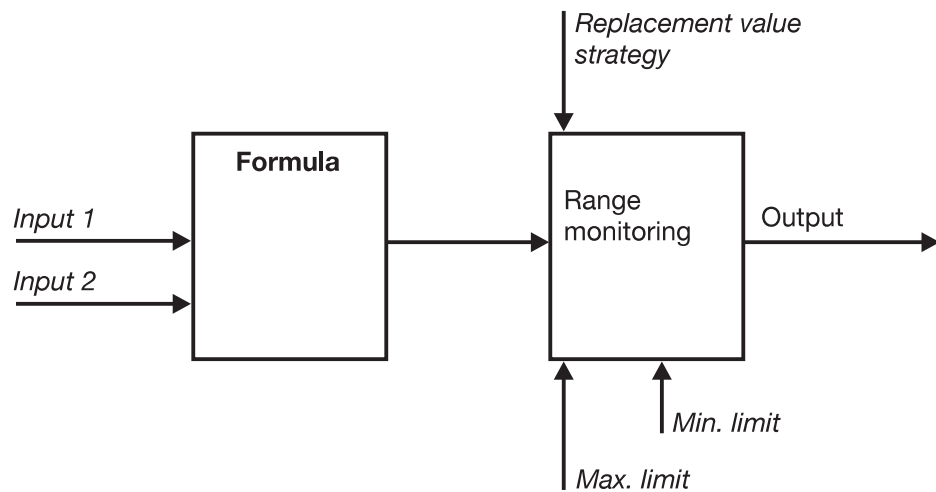
Function

The diagram shows the input and output signals of the function.



Block structure

The block structure shows the internal processing of the signals and the influence of the parameters.



Error handling

If an input is in the Out of Range condition, then “Out of Range” will be signalled to the output.

7.1.11 Limit comparator

The limit comparator is used to monitor the difference between two input values for going above/falling below a limit value or range.

Parameter

Parameter	Selection/settings	Explanation
Input 1 [SellInp1]	No function [0]	Input value 1
	Controller_X [1]	
	Setpoints [2]	
	Ramp [3]	
	AnIn1_Meas [4]	
	AnIn2_Meas [5]	
	Controller_Y1 [6]	
	Controller_Y2 [7]	
	Exter_In [8]	
	Maths [9]	

■ = factory setting [] = short name in the controller operating unit

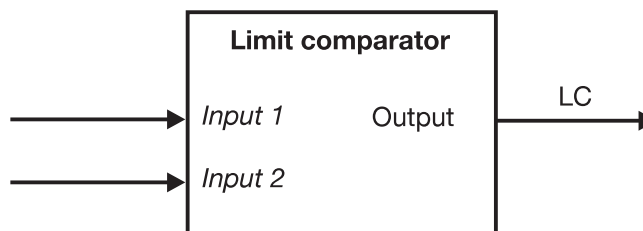
7 Parameter level

Parameter	Selection/settings	Explanation
Input 2 [SellInp2]	No function [0]	Input value 2
	Controller_X [1]	
	Setpoints [2]	
	Ramp [3]	
	AnIn1_Meas [4]	
	AnIn2_Meas [5]	
	Controller Y1 [6]	
	Controller Y2 [7]	
	Exter_In [8]	
	Maths [9]	
Function [Function]	Comparator [Comp]	Defines the function of the limit comparator
	Window discriminator [WDis]	
	Comparator reversed [CompRev]	
	Window discriminator reversed [WDisRev]	
Hysteresis [Hysteresis]	0 – 9999	Difference between the relays switching from ON to OFF and OFF to ON
	1.000	
Replacement value [ReplVal]	Off [Off]	Switching state of the output in the event of faulty communication
	On [On]	
Limit value [LimitVal]	-1999 to +9999	Defines the switching level(s) of the limit comparator
	0.000	

■ = factory setting [] = short name in the controller operating unit

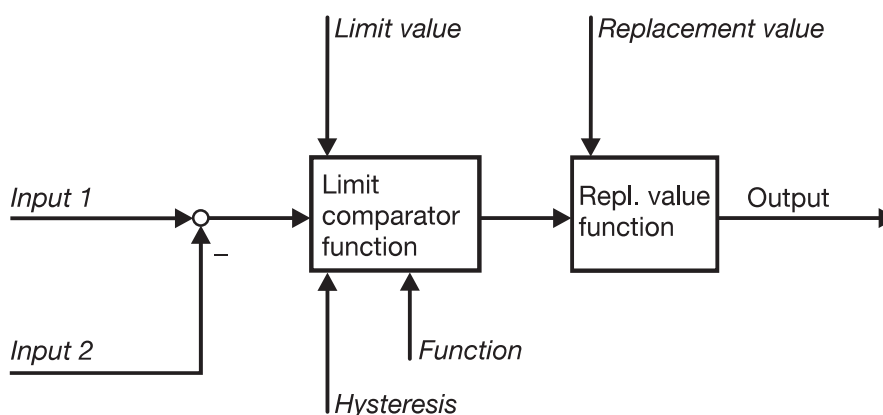
Function

The diagram shows the input and output signals of the function.



Block structure

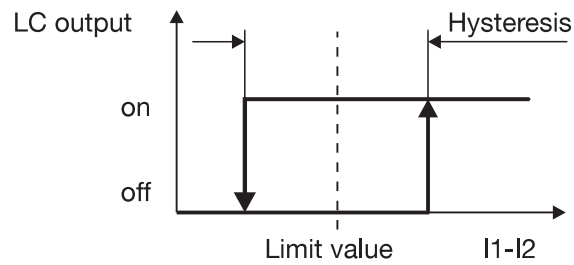
The block structure shows the internal processing of the signals and the influence of the parameters.



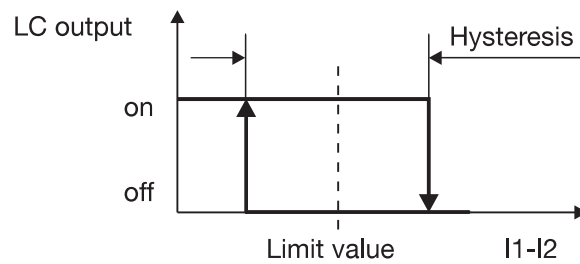
7 Parameter level

A selection can be made between four different limit comparator functions.

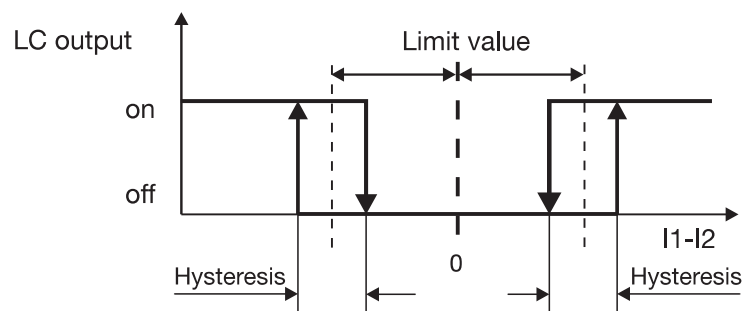
Comparator



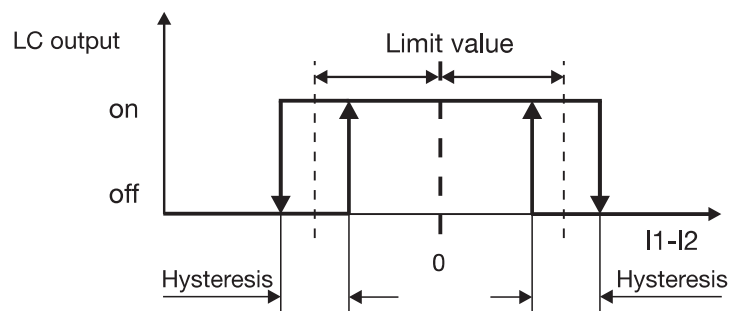
Comparator reversed



Window discriminator



Window discriminator reversed



I1 - Input 1
I2 - Input 2

7 Parameter level

7.1.12 Control output conversion

The function is used to implement a cascade control.

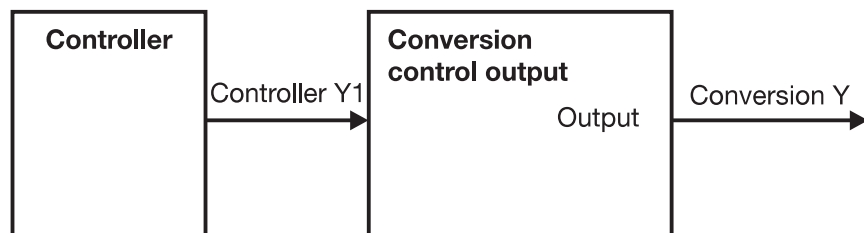
Parameter	Selection/settings	Explanation
Add-in [AddIn]	No function [NoFunc] Setpoint [Setpt] Process value [ProcVal]	The Add-in parameter has the effect that the setpoint or the actual value is added to the normalised control output of the master controller.
Setpoint start [SetptStart]	-1999 to +9999 0.000	Output signal for 0 % controller output
Setpoint end [SetptEnd]	-1999 to +9999 100.0	Output signal for 100 % controller output

■ = factory setting [] = short name in the controller operating unit

Function

This function is used for the scaling of Controller Y1, so that a slave setpoint can be passed to a slave controller. The signal Add-in Y is output via the network.

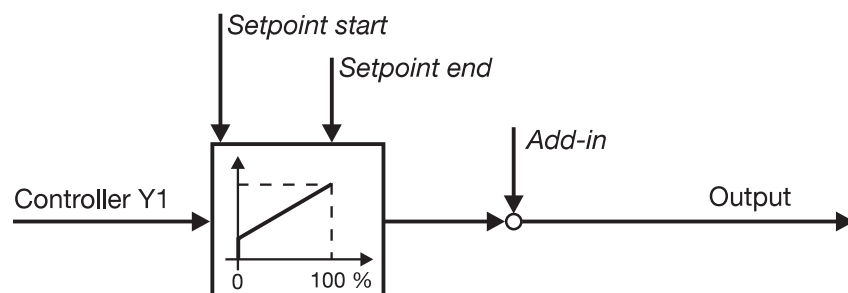
The diagram shows the input and output signals of the function.



With the default settings this function is the same as the signal from Controller Y1 for operating actuators.

Block structure

The block structure shows the internal processing of the signals and the influence of the parameters.



7.1.13 Analogue output

Input values are converted to physical output signals at the analogue output.

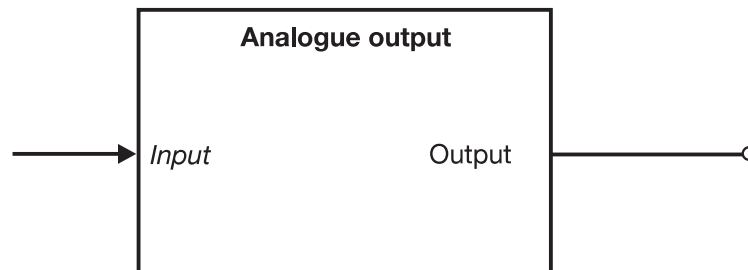
Parameters

Parameter	Selection/settings	Explanation
Conversion start [ConvStart]	-1999 to +9999 0.000	Input signal which corresponds to the low range limit of the physical output signal
Conversion end [ConvEnd]	-1999 to +9999 100.0	Input signals which corresponds to the high limit of the physical output signal
Signal mode [SignalMode]	0 – 20 mA [0/20mA] 4 – 20 mA [4/20mA] 0 – 10 V [0/10V] 2 – 10 V [2/10V]	Determines the physical output signal
Replacement value [ReplVal]	0 – 100.0 % 0 %	Output signal in fault condition
Input [SelInput]	Controller Y1 [0] Controller Y2 [1] AnIn1_Meas [2] AnIn2_Meas [3] AnOut_In [4] Maths [5]	Input signal

■ = factory setting [] = short name in the controller operating unit

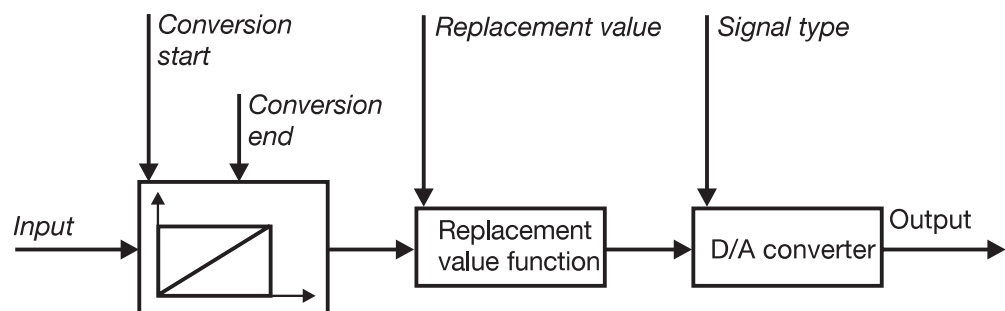
Function

The diagram shows the input and output signals of the function.



Block structure

The block structure shows the internal processing of the signals and the influence of the parameters.



7 Parameter level

7.1.14 Logic output

Switching signals can be produced at two logic outputs.

[LogicOut1]

Parameter	Selection/settings	Explanation
Input [SelInput]	Pulse 1 [0]	Signal source
	Pulse 2 [1]	
	LC [2]	
	LogOut_In [3]	

■ = factory setting [] = short name in the controller operating unit

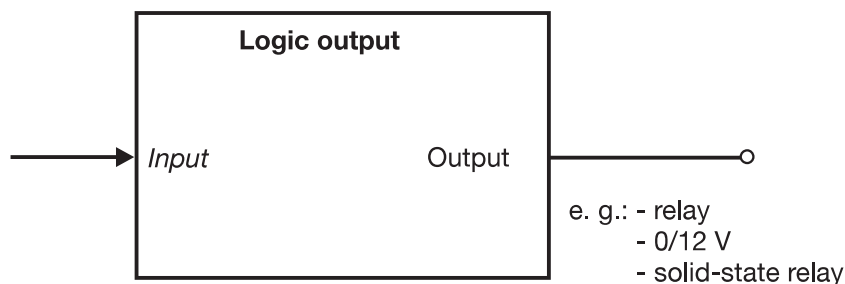
[LogicOut2]

Parameter	Selection/settings	Explanation
Input [SelInput]	Pulse 1 [0]	Signal source
	Pulse 2 [1]	
	LC [2]	
	LogOut_In [3]	

■ = factory setting [] = short name in the controller operating unit

Function

The diagram shows the input and output signals of the function.



7.1.15 Combination alarm

Various signals can be combined to produce a combination alarm.

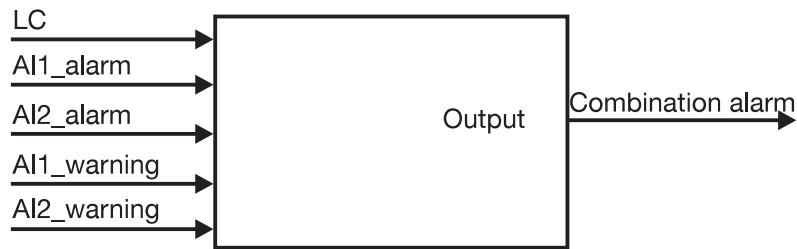
Parameter	Selection/settings	Explanation
LC [SelInput1]	yes [1]	Combination alarm produced [1]
	no [0]	No combination alarm produced [0]
AI1_alarm [SelInput2]	yes [1]	Alarms and warning alarms of measurement inputs AI1 and AI2 can produce a combination alarm signal.
	no [0]	
AI2_alarm [SelInput3]	yes [1]	
	no [0]	
AI1_warning [SelInput4]	yes [1]	
	no [0]	
AI2_warning [SelInput5]	yes [1]	
	no [0]	
Delay time [Delay]	0 — 255s	The combination alarm can be delayed by the preset time.
	90s	

■ = factory setting [] = short name in the controller operating unit

7 Parameter level

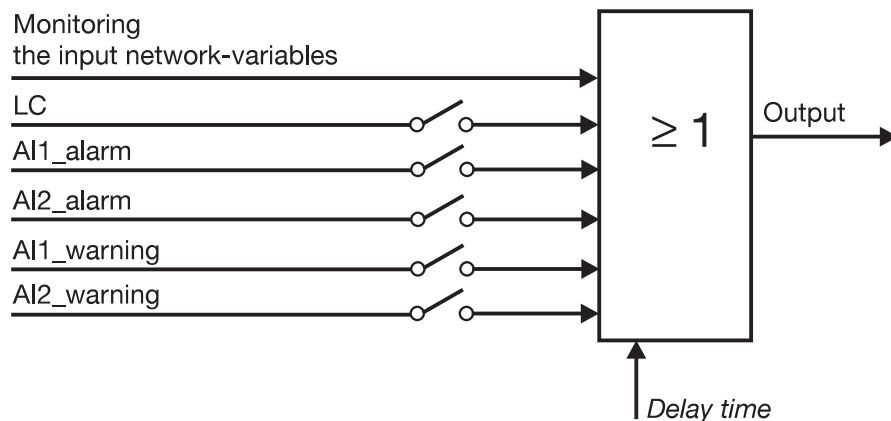
Function

The diagram shows the input and output signals of the function.



Block structure

The block structure shows the internal processing of the signals and the influence of the parameters.



In addition to the network variables which can be selected, the input network-variables are monitored for communication errors or Out-of-Range condition (invalid value).

With both errors a combination alarm will always be produced.

⇒ System Manual 70.4010, Section 6.2 “Response to faulty communication”

7.2 Controller operating unit

7.2.1 Module

A characteristic module name for the task of the module in the process simplifies work with the system.

Parameter	Selection/settings	Explanation
Module name	Operating unit	Name of the module (16 characters)
System number [SystemNo]	1 – 255	The system number is valid for all modules of a system. It is transferred to other modules during installation.
	1	
Module number [ModNo]	1 – 127	The module number differentiates the modules of a system and has to be entered only when, for example, several operating units are operated in one system.
	127	

■ = factory setting [] = short name in the controller operating unit

7 Parameter level

7.2.2 Process windows

Parameter	Selection/settings	Explanation
Scroll time [ScrollTim]	0 – 255s	The process windows appear cyclically in sequence for the preset time.
	5s	
	0s	Scroll function is switched off

■ = factory setting [] = short name in the controller operating unit

⇒ Section 6.1 “Sequence of the process windows”

7.2.3 Alarm windows

Alarm windows signal alarm states which are defined by the user and which have to be eliminated (e.g overrange).

Parameter	Selection/settings	Explanation
Repeat time of alarm indication [ReIndAlarm]	0 – 65535s	After acknowledging an alarm window, the preset time elapses until the alarm message is indicated again, as long as the alarm condition still exists, no other keys are operated and no acknowledgement occurs.
	60s	
	0s	Repeat indication is switched off
Acknowledge [SelAckn]	No function [0]	Alarms are acknowledged only by key.
	LogicIn1 [1]	Alarms are acknowledged by key, or via the preset HW input.
	LogicIn2 [2]	

■ = factory setting [] = short name in the controller operating unit

⇒ Section 9.1 “Alarm windows”

7.2.4 Display

The display can be adapted to its surrounding using the following settings.

Parameter	Selection/settings	Explanation
Language [Language]	Deutsch [Deutsch]	One language is selected from the 3 device languages. The language alters the dialog with the user, but not the system-specific designations, such as the module name, for example.
	English [English]	
	Francais [Francais]	
Contrast [Contrast]	0 – 100%	LCD contrast against the background
	50%	
Switch-off time [OffTime]	1 – 999s	After the last key stroke, the back-lighting remains switched on for the preset time, after that it goes out. If a key is pressed again, it lights up afresh.
	60 s	
	0 s	No time switch-off
Display dark [SelDispDrk]	No function [0]	The back lighting can not be switched off.
	LogicIn1 [1]	The back lighting can be switched off via the selected HW input.
	LogicIn2 [2]	

■ = factory setting [] = short name in the controller operating unit

7.2.5 Logic input

2 logic inputs enable external access to the functions of the controller operating unit.

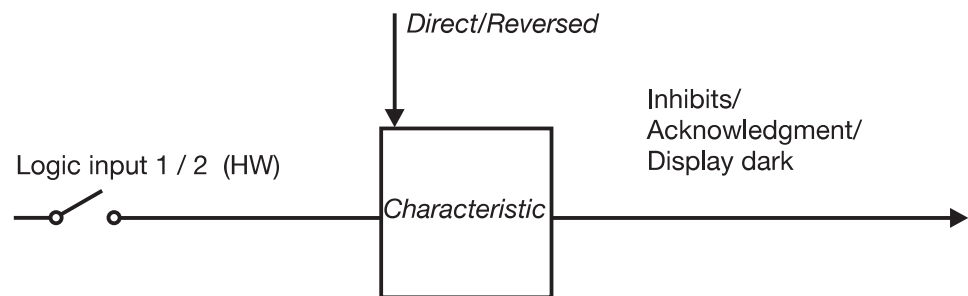
[LogicIn1],
[LogicIn2]

Parameter	Selection/settings	Explanation
Characteristic [Charistic]	Direct [Direct]	When the switch is closed, the logic level is "1".
	Invers [Reversd]	When the switch is closed, the logic level is "0".

■ = factory setting [] = short name in the controller operating unit

2 logic inputs can be connected via floating contacts. They can be used to operate functions in the controller operating unit.

⇒ Data Sheet 70.4045



Functions

- Key inhibit via e.g. the key switch
- Level inhibit against unauthorised access
- ⇒ Section 7.27 "Inhibits"
- LCD back-lighting on/off
- ⇒ Section 7.2.4 "Display"
- Acknowledgment of alarms
- ⇒ Section 7.2.3 "Alarm windows"

7.2.6 Logic output

The logic output can produce an external alarm signal and operate a hooter, for example.

Parameter	Selection/settings	Explanation
Characteristic [Charistic]	Direct [Direct]	The logics level remains unchanged
	Reversed [Reversd]	The logics level is reversed
Cycle time [CycleTim]	0 – 100s	The cycle time (CycleTim) consists of the switch-on time and the switch-off time.
	0	No pulse response

■ = factory setting [] = short name in the controller operating unit

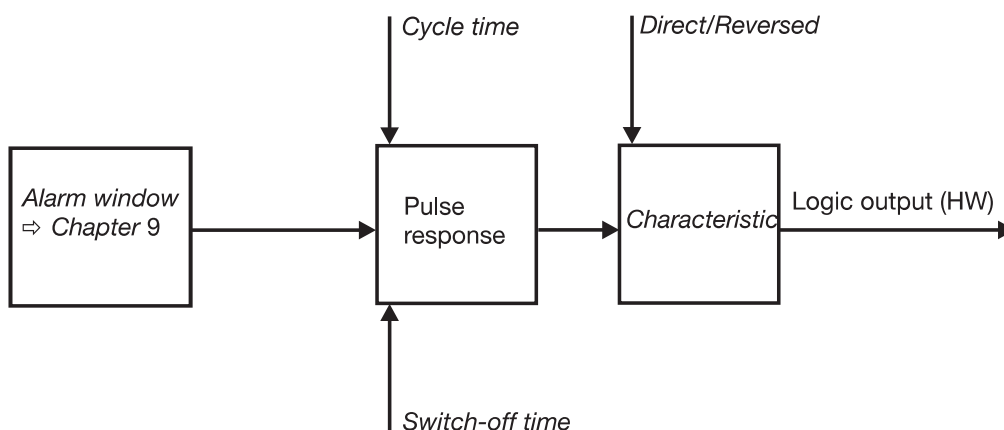
7 Parameter level

Parameter	Selection/settings	Explanation
Switch-off time	0 – 100s	Switch-off time of the logic output
[OffTime]	1s	

■ = factory setting [] = short name in the controller operating unit

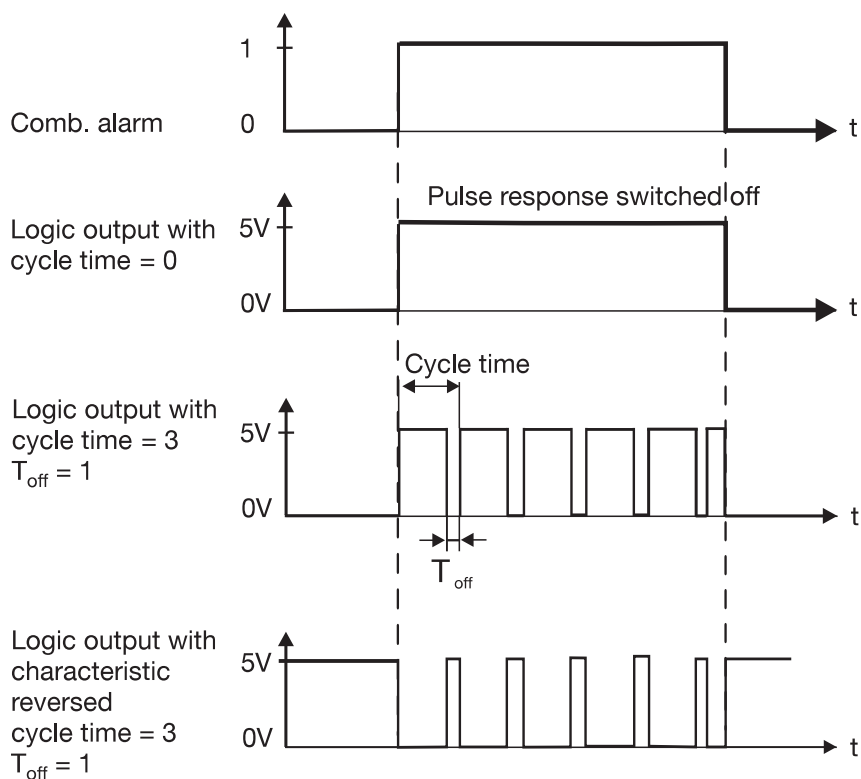
The combination alarm is available as logic output (5V 40mA) at the connectors 3 and 4. It can be used e.g. to produce a hooter or a warning signal.

⇒ Data Sheet 70.4045



Pulse response

Using the two parameters “Cycle time” and “Switch-off time”, a pulse response can be set at the logic output in order to operate a hooter, for example.



7.2.7 Inhibits

Inhibits are used to safeguard against unauthorised access via the controller operating unit.

Parameters

Parameter	Selection/settings	Explanation
Inhibits [SelKeyInh]	No function [0]	Keys can not be inhibited
	Logic_In1 [1]	Keys can be inhibited via the selected HW input
	Logic_In2 [2]	
Process level inhibit [SelPrLvInh]	No function [0]	The alteration of the process values can not be inhibited.
	Logic_In1 [1]	The alteration of the process values can be inhibited via the selected HW input
	Logic_In2 [2]	
Parameter level inhibit [SelParLInh]	No function [0]	The parameter level can not be inhibited.
	Logic_In1 [1]	The parameter level can be inhibited via the selected HW input
	Logic_In2 [2]	
	Logic_In3 [3]	No function
	Logic_In4 [4]	
	Password [5]	The parameter level can be inhibited via a password.
Installation level inhibit [SelInstInh]	No function [0]	The installation level can not be inhibited.
	Logic_In1 [1]	The installation level can be inhibited via the selected HW input.
	Logic_In2 [2]	
	Logic_In3 [3]	No function
	Logic_In4 [4]	
	Password [5]	The installation level is inhibited via a password.
Password [Password1] [Password2] [Password3] [Password4]	0000	4-character password
	0001 — 9999	

■ = factory setting [] = short name in the controller operating unit

Functions

Protection against incorrect operation and unauthorised access.







⇒ Chapter 3 “Mounting in position”

8 Installation

At the installation level, the modules are selected with which the controller operating unit is supposed to communicate.

8.1 Installation level

Menu selection

- * Press  > 2 sec
- * Use  or  to select installation level
- * Acknowledge with 
- * Use  or  to select “Automatic installation”, “Manual installation” or “Modules wink”

Automatic installation

All mTRON modules which are connected to the bus are automatically identified and added to the system.

- * Acknowledge with  (start of the installation)

Autom. install
No. controllers: 2

The controller operating unit then carries out a reset (RESET) .




After a reset the module names may appear to have changed, because the controller operating unit designates new names if module names are duplicated.

Module names can, however, be changed at any time



⇒ Section 7.1.1 “Module”

Manual installation

Only those instruments are added to the system whose installation key has been pressed on the module.

- * Acknowledge with  (N blinks)

Update number ? N
No. controllers: 2

- * “Set as “Y” with , or leave as “N”
- * Acknowledge with 
The number of controllers is indicated
(with “Y” it is set to the current value):


Number is updated !
No. controllers: 1

- * Acknowledge with 



Press installation
key on Module

- * Press installation key on one of the modules

Control.12 recognised
No. controllers: 1

- * Press installation key on all modules which are to be added to the system
 - * Use  to quit the installation level
- The controller operating unit then carries out a reset (RESET).

Modules “wink”

- * Select “Modules wink” in the menu selection
- * Using  or  select the required module name
(The selected module reacts instantly, without acknowledgment)

Control.12 ModNo=001
Wink . . .

Controller modules and communication modules react with a blinking service LED.
Operating units display the message “Wink received”.



The module number is the instrument address for addressing the module via the Modbus-RTU protocol.

⇒ System Manual 70.4040 Part 9

8.2 Operating several installations in one bus system

If several installations are to be operated in one bus system, they must have different system numbers.



Each controller operating unit must have a unique system number set up, before the remaining modules are installed.

⇒ Section 7.2.1 “Module”

8 Installation

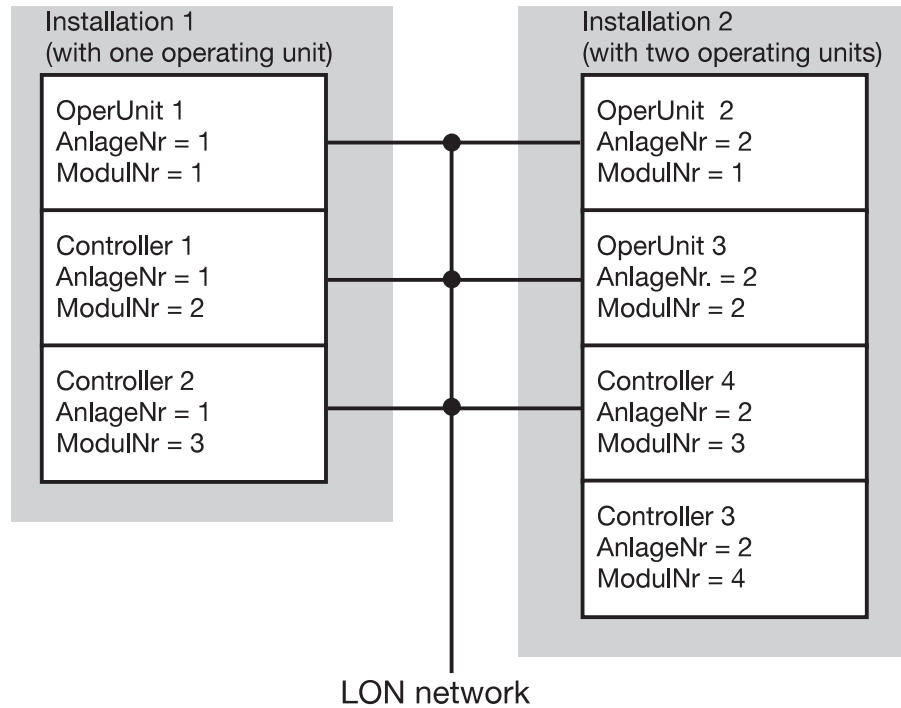
8.3 Operating an installation with several operating units

If an installation is to incorporate several controller operating units, then they must have different module numbers.



The module numbers of the controller operating units must be set before installing the remaining modules.

⇒ Section 7.2.1 “Module”



9.1 Alarm windows

Calling an alarm

At the alarm level, alarms are indicated and acknowledged.


The alarm level can be accessed

1. instantly after a new alarm has occurred,
2. after the repeat time for alarm indication has elapsed,
3. manually via the menu selection "Current alarms".

⇒ Section 5.2 "Operating levels of the controller operating unit"

In the first case, the latest alarm is indicated first, all other alarms in ascending order (arranged according to the module).

Acknowledgment

The indicated alarms are acknowledged in sequence with , afterwards they are no longer indicated until the time for repeat display has elapsed. If the conditions for the alarm still exist, then the alarm window reappears automatically. After all alarms windows have been acknowledged, the process windows are displayed again.

As well as by key, the alarm windows can be acknowledged via the logic inputs. In this case, all alarms are acknowledged simultaneously.

⇒ Section 7.2.3 "Alarm windows"

Logic output

The logic input is activated on all alarm windows, apart from the warning alarm.

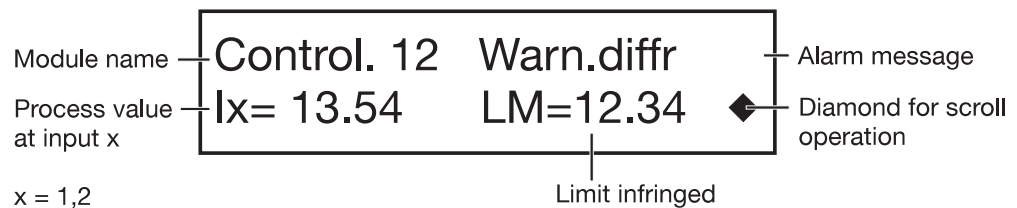
9.1.1 Range monitoring

All controller measurement inputs are subject to a continuous range monitoring. If this results in an alarm or warning alarm, the following alarm windows are displayed on the controller operating unit.

⇒ Section 7.1.2 "Analogue input"

An alarm appears at the top right of every alarm window.

Warning alarm/ alarm

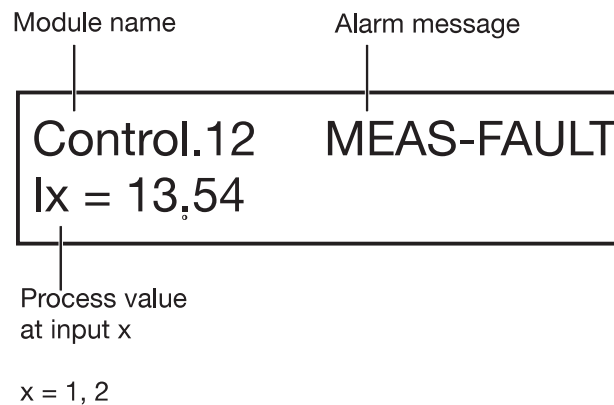


9 Current alarms

Out-of-Range

Out-of-Range (measurement error) is produced in the event of going above/below the sensor measurement range, as well as on sensor break or short-circuit.

The limits depend on the sensor which has been set.



9.1.2 Controller failure

During operation

The controller operating unit monitors all controller modules continuously for their functions during operation. If a failure occurs, the following alarm is output:



on "Reset"

On reset/restart of the controller operating unit, the number of functional controllers is compared with the number of controllers installed. If there is a deviation, the following alarm is output **once**:



This alarm does not result in a repeat display.

10 Key combinations



At this level, the key combinations for “Installation”, “Reset” and “Wink” are displayed. The key combinations for “Reset” and “Installation” are needed for the installation. “Wink” is used to identify other modules.

Reset

A reset of the operating unit is always required after configuration of the system or system parts by the JUMO mTRON-iTOOL project design software and subsequent transfer to the system (downloading).

* Press  +  simultaneously

Installation key

If the  +  keys are pressed simultaneously on the controller operating unit, it sends an identification message.

Receiving a “Wink” message

If a “Wink” message is sent from another controller operating unit to this operating unit, then it responds with the following display:

Wink message recvd.

* Acknowledge the “Wink message” with any key.

11 Current module data

Parameter level

At this level, version number, measurement values and function outputs of all modules of a system can be displayed. Selection and presentation of the parameters are factory-set for each module type.



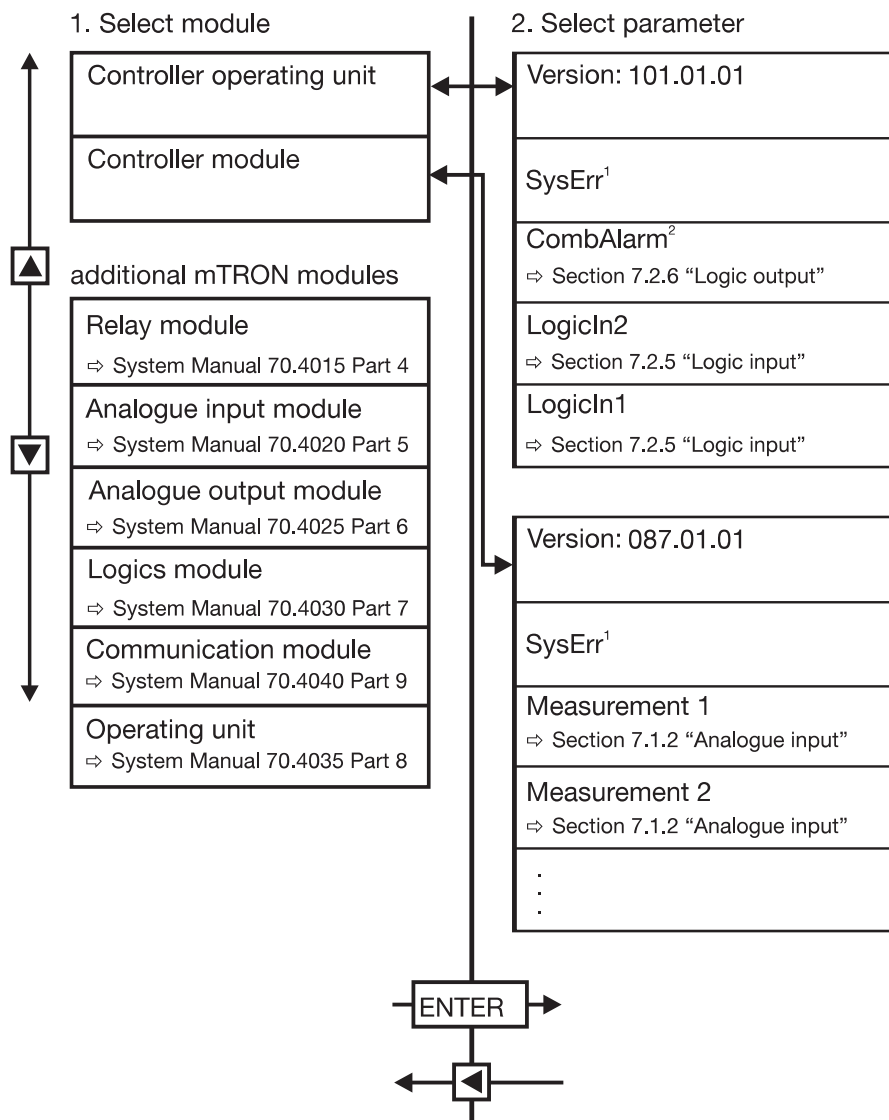
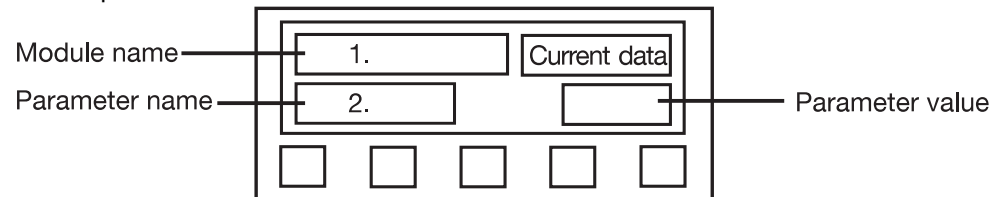
This level only displays values!

Alterations can be carried out at the parameter level or in process windows.

Selecting parameters

The parameters of all modules can be accessed uniformly via a 2-step hierarchy:

1. Select mTRON-module
2. Select parameter



1. At present, no system error is defined ("0" is displayed).

2. "Combination alarm" corresponds to the logics level of the logic output

12 Specific module conditions

12.1 Action after a power failure

After a power failure the controller operating unit performs a normal re-start.

⇒ Section 5.2 “Operating levels of the controller operating unit”

12.2 Action on errors of communication

If a module to which there is no longer any connection, or which has failed is addressed, then the controller operating unit shows the following response:

- Next to the module name, the message “No contact” appears at the parameter and module data levels.
- The process variables of the module which can not be accessed are shown with the replacement display: “-----” (value has not yet been transferred).
⇒ Section 12.4 “Display of symbols”
- In the case of a controller module, an alarm is produced
⇒ Section 9.1.2 “Controller failure”

12.3 Action on faulty installation

Identical network address

If, on a re-start or after “Reset”, the controller operating unit finds several modules with identical network address, “Address error XX” is displayed, XX being the module number which is present several times.

Different module number

If, after a re-start or after “Reset”, the controller operating unit identifies a greater or smaller number of controller modules as installed, the alarm “Controller No.: Error” is produced.

⇒ Section 9.1.2 “Controller failure”



Check installation or re-install it.

⇒ Chapter 8 “Installation”

12.4 Display of symbols

Replacement display of numbers

Symbols	Meaning
+++++	Value invalid (Out-of-Range)
-----	Value not yet transferred
*****	Value does not fit into the preset format (not enough places)
?????	Variable can not be shown